

EFFECT ON REGIONAL PRICE LEVELS OF
SELLING HOGS BY TELETYPE

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Effect on Regional Price Levels of Selling Hogs

by Teletype

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For the purpose of improving the bargaining position of hog producers in the sale of hogs, teletype auctions were established in Ontario in 1961 and in Manitoba in 1965. In the teletype auction, all buyers and sellers can participate in every sale. The hog selling agency, the Ontario Hog Producers' Co-operative or the Manitoba Hog Marketing Commission, located at a central office, send selling messages to all buyers simultaneously by the teletype selling unit. There are buying machines located at the offices of the various processing plants. From the message sheet, a buyer receives the selling message transmitted by the selling agency. The price tapes are prepunched on a declining price scale in drops of five cents per hundredweight. When a buyer sees the price he is willing to pay he just presses the buying button and the lot of hogs is his if he is the first bidder.

Theoretically, the teletype auction is more competitive in bidding for hogs than is the traditional non-mechanized auction. The packers are induced to bid more aggressively for hogs and, therefore, to pay higher prices to producers.

The main purpose of this study was to analyze inter-market price differentials between Toronto and Winnipeg prior to and subsequent to the introduction of the teletype selling mechanism to determine the

effect of the selling system on the level of hog prices. Samuelson's spatial equilibrium model respecting price difference in space was employed. For the purpose of analyzing the specific problem for this study, Samuelson's model has been modified. The modified spatial equilibrium model stated that the hog price spread equalled the sum of the meat transportation cost plus the effect of the teletype system on hog prices rather than that the hog price spread equalled the meat transportation cost.

In this study, the monthly and weekly dressed grade A hog price spreads between Toronto and Winnipeg during the period from December 1958 to June 1968 were used as the basis for analysis. The price series were divided into three sub-periods, i.e., Period I (before teletype), Period II (teletype in Ontario only), and Period III (teletype in both Provinces).

Considering the expected price spread in each period: in Period I, the price spreads were expected to be equal to the transportation costs (T.C.); in Period II, the price spreads were expected to be greater than T.C.; in Period III, the price spreads were expected to be equal to T.C. These hypotheses were accepted by the Student-t tests. Considering the frequency distribution of the net price spread (NPS): in Period I and III, the numbers of positive NPS and the negative NPS were expected to be the same; in Period II, the number of positive NPS were expected to be more than that of negative NPS. These hypotheses were accepted by the sign-test.

From the evidence, it was concluded that the teletype selling system both in Toronto and Winnipeg had a significant effect on hog

prices. Based on the weekly hog prices, after the teletype system was established, it apparently increased the price received by hog producers from the sale of hogs by fifty cents per hundredweight or eighty-one cents per head. Subtracting the additional teletype operation costs from the gross increased price, the estimated net increments in the hog price were approximately 46.5 cents and 55.5 cents per head in Ontario and in Manitoba respectively. The total increased net returns to hog producers would be approximately \$1,200,000 and \$300,000 per year in Ontario and in Manitoba.

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CHAPTER I

INTRODUCTION

In order to maximize the degree of competition between the packers and to increase the returns to hog producers from the sale of hogs, the teletype auction was adopted in Ontario in 1961 and in Manitoba in 1965. At the present time there is only one seller of hogs in Ontario. All Ontario-raised hogs must be sold through the Ontario Hog Producers' Co-operative, the selling agent of the Ontario Hog Producers' Marketing Board. In Manitoba, there exist two main selling methods for hogs. One is by teletype auction, the other is by direct sale to packing plants by private treaty. The teletype auction method of sale is operated by the Manitoba Hog Marketing Commission. The Commission has responsibility under the Manitoba Natural Products Marketing Act to administer regulations respecting the marketing of hogs produced in the Province.

The main purpose of this study is to estimate the effect of the teletype selling system on the average level of hog prices. Before discussing the specific problem in detail, this study will review the events and circumstances which led to the development of the system of marketing hogs and describe the operation of the new selling mechanism.

I. THE HISTORICAL BACKGROUND FOR THE DEVELOPMENT OF THE TELETYPE AUCTION

Hog Marketing in Ontario¹

Ontario's compulsory teletype auction for selling hogs is one of the most interesting methods that has yet been developed anywhere in the world for the marketing of a major farm product. The innovation of the present hog marketing system in Ontario evolved through several stages.

The formation of the Ontario Hog Producers' Association in 1941. The Ontario Hog Producers' Association was formed largely because producers were dissatisfied with falling market prices for hogs.

At that time, there were three main methods of selling hogs by Ontario farmers: (1) through a commission agent located in the public stockyards; (2) through truckers who picked up hogs at country points and delivered them to processors on behalf of the producers; and (3) through the hog producer, himself, delivering and selling directly to the packing plant.² Among these three methods, the first one gradually declined in relative importance as a market channel for hogs. On the other hand, direct shipping increased in popularity. For example, in

¹The historical review of hog marketing in Ontario as presented in this section draws heavily on G. F. Perkin, Marketing Milestones in Ontario 1935-1960, Ontario Dept. of Agriculture (Toronto, Ontario, 1962), pp. 50-65.

²Select Committee of the Legislative Assembly of Manitoba, Livestock Marketing in Manitoba (Winnipeg: Queen's Printer, Feb. 1964), p. 86.

1922, 64 per cent of Ontario-raised hogs were shipped directly to packing plants. A negligible amount was exported directly. More than 35 per cent of the hogs were sold through public stockyards. In 1928, when the carcass grading system was introduced, 75 per cent of the hogs were shipped directly to plants. In 1940, when the carcass grading system became compulsory, approximately 90 per cent of the hogs were sold by farmers through truckers, or by themselves shipping directly to packing plants. It is evident that a strong tendency existed for hog marketing to shift from the public stockyards to the packing plants (see Table VI).

In Professor Kenyon's opinion,³ the trend was caused by four major factors. These were: (1) the development of the trucking industry which led to the geographic decentralization of the packing industry; (2) the establishment of rail grading by government inspectors which meant that the services of skilled sales agents were no longer as necessary for the producers; (3) the absence of marketing charges for direct sales; and (4) the inducement by packers by such devices as the payment of "bonuses" to truckers to encourage them to ship producers' hogs to their plants directly.

The adoption of the method of selling hogs by delivery directly to the packing plant may have placed the producers in an inferior bargaining position with packers and thereby lowered returns to producers. Perkin states that "this is such an unsatisfactory method of marketing

³ N. L. Kenyon, The Marketing of Hogs in Ontario, (Dept. of Agricultural Economics, Ontario Agriculture College, Guelph, 1958).

as to be almost unbelievable. No better method could be devised of depriving the hog feeder of bargaining power."⁴ The producers were dissatisfied with the results and this led to the development of the Ontario Hog Producers' Association in the fall of 1941. This Association, a non-profit organization, was intended to gain greater countervailing power for the hog producers against the packers.⁵

The Ontario Hog Producers' Marketing Board was approved in 1946.

During the early years of the depression the Federal Government was pressed to enact legislation to bring about a more orderly marketing of agricultural products. The Government drafted a bill to set up a Dominion Marketing Board, which was to have extensive powers to regulate and control the marketing of products. This Board was to be able to delegate some or all of these powers to local boards. The local boards, by provincial authority, were able to control intraprovincial marketing of their products.

The Natural Products Marketing (Canada) Act became law in 1934.⁶

Ontario passed the Farm Products Control Act in 1937. The Act gave authority to the Lieutenant Governor in Council to appoint a provincial

⁴ Perkin, op. cit., p. 50.

⁵ Livestock Marketing in Manitoba, p. 87.

⁶ L. E. Poetschke, and W. M. Mackenzie, The Development of Producer Marketing Boards in Canadian Agriculture (University of Alberta, Edmonton, 1957), p. 4.

marketing board, namely, the Farm Products Marketing Board. Ontario later passed the Farm Products Marketing Act in 1946. This Act gave powers to investigate trade practices, establish negotiating committees, and regulate and control marketing, or to establish a market agency.⁷

In 1945 the Hog Producers' Association applied to the Ontario Farm Products Marketing Board for the right to set up a hog marketing board for the purpose of selling their hogs. A vote among producers showed a 92 per cent majority to be in favour of setting up the board. The scheme was approved in May, 1946.⁸

The Negotiating Committee during 1946-1951. The first plan of the Ontario Hog Producers' Marketing Board was of the negotiating committee type. It comprised five appointees of the marketing board and five representatives of the packers. The Committee was empowered to negotiate agreements respecting minimum prices, forms of contract, conditions of sale, price differentials, and several other matters. However, it could not enforce price primarily because it did not have complete control over the supply or delivery of hogs. Perkin states that: "On August 1st, 1951, the packers served notice they would not meet the producers again if the producers were going to discuss the question of price."⁹

⁷Ibid., p. 14.

⁸Perkin, op. cit., p. 51.

⁹Ibid., p. 52.

United Livestock Sales Company during 1952-1955. As a result of failure to reach agreement respecting minimum prices for hogs, the Marketing Board decided to appoint a marketing agency. The Board desired greater bargaining power, but wanted to disturb the existing system as little as possible. It was felt that commission agents operating on the stockyards should continue to do so as a unified body under the direction of the Hog Board. The Board was successful in bringing the five commission firms into the stockyards together with the United Co-operative of Ontario, to form a joint stock company called United Livestock Sales Company Limited (U.L.S.C.). The Company commenced operations on January 23rd, 1953.¹⁰ It was granted power to establish price, to sell the product, to direct the movement of hogs, and to handle payments to producers.

Over the period of its operation, from January 1953 to March 1955, the agency was able to have only a minor influence on prices. Since the packers paid freight assistance to truckers to bring hogs in from outlying districts, only about 10 per cent of sales were made through the stockyards. As a result of its failure to exert as much influence on the hog marketing system as the producers anticipated it would, the United Livestock Sales Ltd. came under heavy criticism.

Ontario Hog Producers' Co-operative was formed in 1955. The Marketing Board concluded from its experience through U.L.S.C. that physical

¹⁰Ibid., p. 53.

possession of hogs was necessary for effective price bargaining. On May 31, 1955, the Marketing Board appointed the Ontario Hog Producers' Co-operative Ltd. (O.H.P.C.) as the marketing agency and revoked the appointment of the U.L.S.C.¹¹ O.H.P.C. was granted the power to control the sale of all hogs in the Province. The compulsory directional program was developed from west to east as a number of new assembly points were established. By the end of 1956, upward of 75 per cent of all the hogs graded in Ontario were being sold on the open market at fourteen assembly points from twenty-one counties.¹²

A series of directional orders for physical control over all hogs sold by the Co-operative was issued in September, October and December, 1957 and in January and April, 1958. But on July 14, 1958, the Supreme Court of Ontario announced that "the hog marketing plan was never valid under the law since it had not been preceded by a vote of the producers."¹³ A vote was finally taken on July 25th, 1958. Of 78,794 registered producers, 47.4 per cent voted, and 67.5 per cent of the votes favoured continuance of the existing marketing plan. A majority of 66.66 per cent was required by the Ontario Farm Products Marketing Board. After the voting, the Government of Ontario publicly announced its full support to the existing plan, because the majority of producers

¹¹Ibid.

¹²Ibid., p. 54.

¹³Ibid., p. 57.

were in favour of the principle of the plan.¹⁴ Had the vote failed, then the existing hog scheme would presumably have been revoked.

During the period 1955 to May 1961, the prices of all hogs under the control of the O.H.P.C. were negotiated with the packers. As hogs arrived at the various assembly yards scattered throughout the Province, the head office of the Board in Toronto was informed by telephone. When the O.H.P.C. had determined its asking price, it solicited and received bids from individual firms by telephone.

The packers agreed to the basic principles of a producers' marketing board. But they did not approve of the system of price determination for hogs and allocation of the supply of hogs and demanded an open auction method. The Board was unalterably opposed to the open auction method. They were fearful that such a system would foster greater collusion among the packers, with the result that bids would be lower than they otherwise would--to the detriment of the producers. Owing to the conflict between the packers and the marketing board, the latter agreed to take no action to extend the compulsory direction program of hog marketing in Ontario until the issues were settled. In 1958, the marketing agency directed some 85 per cent of hogs to the open market through fifteen assembly points from twenty-seven counties.¹⁵

At the end of 1960, a notable change was made in the method of hog sale. A new plan provided that all hogs had to be sold by the

¹⁴ Ibid., p. 59.

¹⁵ Ibid., p. 55.

agency, i.e., the Ontario Hog Producers' Co-operative Company, through the operation of a teletype system. This new selling method, which began on May 8th, 1961, replaced the private treaty method of sale by telephone. The operation of the teletype selling mechanism will be discussed later.

Hog Marketing in Manitoba¹⁶

Union Stock Yards in St. Boniface. Before the turn of the century the agricultural community was made up largely of broadly diversified and largely self-sufficient units. The processing of meat was carried out by farmers for their own use and by individual butchers in the towns who purchased livestock directly from the farmers, and processed and retailed the end products to the town housewife. The Manitoba farm population decreased from 72.4 per cent of the total Manitoba population at the beginning of the century, to 16.8 per cent in 1966 (see Table VII). The reduction in farm population was accompanied by concentration of farm production on more specialized farm units. Since 1900 there has been a noticeable change in the farm production pattern and a consequent need for changes in the marketing structure. Livestock is highly perishable and must be marketed when it is ready in order to produce the best meat and realize the highest returns to the producer. The need for an adequate public livestock market, centrally located, was recognized by

¹⁶ The historical review of hog marketing in Manitoba as presented in this section is drawn primarily from the submissions to the Special Committee on Livestock Marketing in Manitoba by the Manitoba Farmers' Union, Manitoba Pool Elevators, Manitoba Federation of Agriculture, and the Manitoba Hog Producers' Association.

farmers. The Union Stock Yards in St. Boniface, Manitoba was opened on August 14th, 1913.¹⁷

The St. Boniface Stock Yards is the largest market of its kind in Canada. The Yards, which are owned jointly by the C.N.R. and the C.P.R., have extensive facilities for the handling and selling of various kinds of livestock. The capacity of the yards is in the neighborhood of 14,000 cattle, 8,000 hogs and 2,000 sheep, although larger numbers have been handled on different occasions. There are fifty-four chutes for loading and unloading of livestock arriving or departing by railway as well as by truck. In the yards, many services are rendered by separate groups. Each group operates in its own particular field. The stock yard company, the Public Markets Limited, provides certain facilities and certain services, but it does not engage in buying and selling.¹⁸

The Winnipeg Livestock Exchange. The Winnipeg Livestock Exchange, a voluntary organization, was formed in October 1914. The Exchange was established to set up and maintain rules and regulations respecting buying and selling activities in the Union Stockyards. It consists of ninety-five members of the livestock industry representing commission firms, packing house buyers, wholesale butchers, order buyers, dealers,

¹⁷ Winnipeg Livestock Exchange, Submission to the Select Standing Committee on Agriculture, Government of Manitoba (Winnipeg, March 1957), p. 2.

¹⁸ Ibid., p. 3.

and traders, all of them doing business in the Yards.¹⁹

When a producer ships his livestock to the public stockyards, he may consign them to one of the several commission firms operating in the Yards. The producer may also elect the method of sale. Most of the cattle shipped to the Yards are sold by public auction. In 1953, an experiment was undertaken in selling hogs by public auction. The attempt was made by Manitoba Pool Elevators at Brandon. The volume of shipment to the public auction was so small that it proved unsuccessful and it carried on for only about nine months. Previous to 1965, hogs were not sold by public auction. All of them were sold by private treaty.²⁰

Hog Marketing Board for Manitoba. In 1922, grading was first instituted for live hogs as part of a nation-wide program to improve the quality of Canadian bacon hogs. In 1934, rail grading was started, presumably to further improve bacon hog quality and to give fairer returns to the quality producer. In 1940, the compulsory system of rail grading was instituted by the Federal Government.²¹

Since the inauguration of carcass or rail grading and the marketing of hogs on a carcass grade basis, there has been a gradual transi-

¹⁹Ibid., p. 4.

²⁰Manitoba Farmers Union, Supplementary Brief to the Special Legislative Committee Studying Livestock Marketing in Manitoba (Winnipeg, Dec. 1961), p. 6.

²¹H. J. Maybee, Hog Grading in Canada, Canada Dept. of Agriculture (Ottawa, Sept. 1962), pp. 5-11.

tion from the selling of live animals through the stockyards or public market to shipments directly to the packing plant. In 1922, only 16 per cent of Manitoba hogs were delivered directly to plants. In 1935, the percentage had increased to 53 per cent. In 1941, 86 per cent of Manitoba hogs were sold to packing plants directly (see Table VI). The Manitoba Farmers Union stated that, "the rail grading of hogs almost completely eliminated the hog producers' bargaining power in Manitoba."²²

In order to gain countervailing power in the marketing of hogs, the 1952 Manitoba Federation of Agriculture and Co-operation Annual Provincial Convention supported the principle of the establishment of producer marketing boards on hogs and poultry. The M.F.A.C. appointed a Hog Committee in October 1953 to draft a Hog Producers' Marketing Plan. After half a year, the Hog Committee recommended that a Manitoba Hog Marketing Board be set up whose responsibilities would be to market all Manitoba hogs and to appoint a marketing agency to sell all hogs to the highest bidder. The Committee also stated that the Manitoba hog marketing plan should be integrated with similar plans in Saskatchewan and Alberta and should not become operative until those two Provinces were prepared to commence operations.²³

In 1961, the M.F.A.C. still considered that some type of central bargaining agency was needed on behalf of hog producers. At that time,

²² Manitoba Farmers Union, op. cit., p. 6.

²³ Manitoba Federation of Agriculture and Co-operation, Newsletter, April 2, 1954.

they pointed out that, "a single marketing agency in Manitoba is not feasible, without similar arrangements in both Saskatchewan and Alberta, with the possible inclusion of Ontario."²⁴

A submission by Manitoba Pool Elevators also claimed that a hog marketing board operating only in Manitoba would be quite inadequate. The Pool noted that there is no legal restriction on interprovincial trade under the British North America Act. In order to avoid nullifying the bargaining power that the Manitoba hog producers would have under board regulations, it would be necessary, the Pool claimed, to exercise complete control by the producers of all hogs marketed in the Prairie Provinces. The Pool believed that the time is still somewhat distant before that arrangement could be realized. Since the Manitoba Legislature passed the Manitoba Natural Products Marketing Act in the spring of 1939, the question of the establishment of a hog marketing board had been discussed frequently, but no action had been forthcoming.²⁵

Manitoba Hog Marketing Commission. On April 14, 1961, a resolution was approved by the Legislative Assembly of Manitoba that a Special Committee of the House, a five member committee, be appointed to study and inquire into all phases of the livestock marketing system in the

²⁴ Manitoba Federation of Agriculture, Submission to the Special Committee on Livestock Marketing in Manitoba (Winnipeg, Sept. 1961), p. 8.

²⁵ Manitoba Pool Elevators, Presentation to the Special Committee on Marketing of Livestock in the Province of Manitoba (Winnipeg, Manitoba, Sept. 1961), pp. 7-18.

Province of Manitoba.²⁶ In February 1964, the Special Committee presented its Final Report. One of the major recommendations was that a voluntary teletype auction method of marketing hogs be instituted in the Province. In May 1964, the Government of Manitoba established an "Advisory Committee" to assist in forming a "Marketing Commission."

The Manitoba Hog Marketing Commission was established on February 25, 1965. Since that date, the Commission has had responsibility under the Natural Products Marketing Act to administer regulations respecting the marketing of hogs in the Province.²⁷

II. A TELETYPE SYSTEM FOR MARKETING HOGS

Assembly Arrangements

Arrangements for assembly of hogs in Ontario. In general, the movement of hogs to market consists of two phases or processes: assembly and sale. In Ontario, since May, 1961, the Ontario Hog Producers' Marketing Board has operated a teletype system from its own office in Toronto and has assembled all Ontario-raised hogs at forty-eight stockyards in Ontario and one at the West End Montreal Stockyards. The Board owns five of the forty-nine assembly yards and rents space for the rest. Among these forty-nine assembly points, only two yards (Toronto and

²⁶Livestock Marketing in Manitoba, p. 5.

²⁷Manitoba Hog Marketing Commission, Annual Report, March 1966, p. 1.

Kitchener) are operated five days a week; six yards²⁸ are open four days a week, excluding Friday; the one at Ancaster is open three days a week; and all of the forty other yards operate only one day a week or only when the supply of hogs merits operation. The location and maintenance of assembly yards depends on the density of hog population, patterns of movement to market, and the location of packing plants.

When the compulsory direction of hogs to one of the hog assembly yards was extended to all hogs produced in Ontario, it was considered necessary to increase the number of assembly yards. Due to the cost of establishing and maintaining the increased number of assembly yards, the operating costs of the Board increased. During March, 1958, the Board authorized its marketing agency, the O.H.P.C., to increase its service charge from twenty-nine cents per hog to forty cents per hog.²⁹

Arrangements for assembly of hogs in Manitoba. Since February, 1965, the voluntary teletype auction method for selling hogs has been in operation in Manitoba. Producers can exercise their option and sell directly to the packer. It is required that these producers make application to market direct in person or by mail to one of the two offices of the Commission.³⁰ They then receive a supply of "Direct Sale Forms,"

²⁸These are located at Chatham, London, Berford, Harriston, Stratford, and Barrie.

²⁹Perkin, op. cit., p. 55.

³⁰The Head Office of the Commission is located at the Union Stock Yards, St. Boniface. The other office is located at the Co-operative Stock Yards, Brandon.

one of which is used for each sale. In the 1965 fiscal year which ended in March, 1966, 62 per cent of the hogs of Manitoba origin were sold by the Commission. In the 1966 and 1967 fiscal years, 60 per cent and 57 per cent of the hogs were sold, respectively, in the same way.³¹

In Manitoba, there are only two yards--one is the Union Stock Yards at St. Boniface; the other one is the Co-operative Stock Yards at Brandon. Neither of them are owned by the Commission. The Commission operates from rented space at the St. Boniface Yards and pays yardage and handling charges for each hog. The costs of operating are covered by a levy of thirty cents per hog on all hogs of Manitoba origin.

If the hogs are sold through teletype auction, there are two alternatives provided for assembly of hogs. First, the hog producers may deliver their hogs to an assembly yard. Secondly, they may call by telephone and notify the office of the Commission regarding the number of hogs loaded on truck and the estimated time of arrival and offer the hogs for sale in transit.³² The latter plan has the advantage of reducing the shrinkage and bruising by direct delivery to the packing plants while retaining the advantage of a competitive market. The Commission encourages producers or their Public Service Vehicle truckers to take advantage of this type of selling. The "On Truck en Route" sales have proven to be very popular. In 1966, approximately 35 per cent of total

³¹ Manitoba Hog Marketing Commission, Third Annual Report, March, 1968, p. 7.

³² On truck selling is limited to a minimum number (10 head) suitable for auction over the teletype.

marketings were handled in this manner.

The hauling may be done by producers' own trucks or they may use a commercial carrier. The chosen location at St. Boniface or at Brandon becomes the point from which the selling agency offers the hogs for sale.

Equipment for the Teletype Operation

The selling or hog auction equipment sends messages to all buyers simultaneously by teletype, and also receives bid messages from the buyers. The machine has three main components technically referred to as: the Master Teletype Machine, the Electronic Broadcast Repeater, and the Teletype Buying Machine.³³ The first two are the components of the selling unit.

The selling unit. The Master Teletype Machines are located in Toronto, the Office of O.H.P.C. and in St. Boniface, the Head Office of the M.H.M.C.

Each assembly yard notifies the selling agency of receipts of hogs either by teletype or telephone. The choice of equipment depends on volume relative to cost. In Ontario, nine assembly yards which are operated three days a week or more, are equipped with TWX and the remaining forty yards use telephones.³⁴ In Manitoba, both the St. Boniface yard and the Brandon yard use teletype equipment known as Telex or TWX.

³³J. R. Kohler, Report by General Manager, Annual Meeting, Ontario Hog Producers' Co-operative (Toronto, Sept. 14, 1961).

³⁴J. A. Brown, A. A. Heidt and R. H. D. Phillips, Hog Marketing in Saskatchewan, A preliminary report prepared for the Saskatchewan Advisory Swine Council (June 1966), p. 11.

The Master Teletype Machine is connected with a specially designed piece of equipment called an Electronic Broadcast Repeater to form the selling unit. All offerings are made by the selling unit. The Toronto teletype selling unit is connected to eighteen buying teletypes. The Winnipeg (St. Boniface) unit is connected to nine buying machines.

An Electronic Broadcast Repeater is a piece of equipment on the face of which is a series of letters, each identifying a buying machine. Above each of these code letters is a white light and below the letter is a red light. The white light flickers when the selling system is in operation, indicating the respective packers' buying machine is in contact. The red light under a code letter flashes when the particular buyer is successful in his bid for the lot of hogs being offered.

The buyer's equipment. There are message sheets and a buying button on the Teletype Buying Machine. The message sheet provides a printed copy of all incoming and outgoing messages and signals. The buying button is pressed by the buyer when he sees the price he is willing to pay printed on the message sheet. The equipment is sensitive enough to distinguish between and eliminate the possibility of two buyers pressing their buttons at the same time.

In Ontario, there are eighteen buying machines. Among them, sixteen machines are located in various processing plants across Ontario; one is located at Hull, Quebec; the eighteenth buying machine is located at a separate room in the office of the Board. This machine is available to small packers and brokers, as well as to agency personnel who have been requested to buy on behalf of small packers.

In Manitoba, eight teletype buying machines are located in the major packing plants in the Province. Of these, seven are located in St. Boniface and one is located in Brandon. In addition, one order buying machine is located in the office of the Commission. In Ontario the meat packing companies pay the entire rental for the teletype equipment. In Manitoba, the buyers pay the rental for the buying machines and the Commission pays all other rentals. The Commission pays approximately 60 per cent of the total cost of the teletype equipment.

Pricing Procedure

All hogs are put on teletype auction by the selling agency for sale on the basis of hundredweights of Grade A dressed carcass. Predetermined price differentials are provided to cover those hogs that are not dressed out as Grade A. The selling agency offers all sales basis F.O.B., the location stated in the offering. The following will describe briefly how this system works.

When hogs arrive at one of the assembly yards, the yard manager groups the hogs into lots containing the number of hogs requested by the sales staff in the teletype selling office. When a lot at any yard is ready for offering, the manager notifies the sales office indicating the number of hogs ready for sale. If the market appears favorable for a sale from the particular yard, the sales staff in the head office gives the operator of the Master Machine a written order to offer these hogs for sale. The operator teletypes out the date and time, and the assembly yard from which the hogs are being offered, the lot number,

and the number of hogs in the lot. For example: "September 1/61 10:30 Stratford Lot 35-150 Hogs." Then, the teletype operator starts a tape on the machine. The agency has a number of price tapes and makes a selection based upon market intelligence. The price tape selected by the committee of the selling agency is as high as appears feasible. Usually the sales committee compares the movement into the trade, into export, into or out of storage or cure and notes whether the price is meeting buyer resistance or a good buying demand. From this information, asking price is determined by the agency.

The tapes have been prepunched on a declining price scale in drops of five cents per hundredweight over a one dollar range. The offering appears on all buying machines and the Master Machine simultaneously. All buyers would have an equal chance to buy a particular lot of hogs at the current market price. When a buyer sees the price appearing on the buying machine that he is willing to pay for that lot of hogs, he presses his buying button and the hogs are his if the other processors have not bid prior to him.

The red light appears on the face of the Broadcast Repeater under the buyer's code letter, which indicates to the Master Machine operator the identity of the buyer who has bought this particular lot of hogs. Immediately after, the Master Machine automatically prints the buyer's code letter on the recording sheet. The operator types a recap or summary of the lot offering including price. The successful bidder confirms by typing "OK and the name of his firm." This confirmation is important because it constitutes the legal contract to pur-

chase at the price shown on the tape. The Master Machine broadcasts the buying price to all buying machines, but omits the successful buyer's name.

If the price declines, for instance, from \$30.00 to \$29.00 without a bid taking place, "no sale" is automatically printed on all message sheets. This particular lot of hogs is re-offered later when conditions are more favorable, or a lower price tape will be selected and the auction renewed. Each lot of hogs is offered by the same procedure.

The Ontario Board operates its teletype circuit from 9 a.m. to 5 p.m., Monday to Thursday and from 9 a.m. to 1 p.m. on Friday. The Manitoba Commission operates its teletype circuit daily from 10 a.m. to 12 noon and 1 p.m. to 2 p.m., Monday to Friday.

CHAPTER II

OBJECTIVE AND SCOPE

I. OBJECTIVE OF THE STUDY

The objective of any scientific study is to increase the available knowledge about a particular subject. In order to maximize returns to hog producers, the teletype selling method was adopted in Ontario and Manitoba. However, up to the present, the critical investigation of the teletype system has been limited. The effect of the new selling mechanism, is still open to question. The main object of this study is to estimate the effect of the teletype selling system on the hog price level. A similar analysis has been made, independently and just prior to this thesis, by Mr. Lowe.¹ His thesis will be briefly reviewed in Chapter V.

In the previous Chapter, it was explained how the new selling mechanism was introduced and how it is operated. In the following Chapter, the question will be examined on a theoretical basis of how the new system may improve the hog grower's position in the market and increase the returns to the farmers. This study is an attempt to analyze inter-market hog price differentials, prior to, and subsequent to, the introduction of the teletype selling mechanism in order to determine the effect of selling method on the level of hog prices. The basic concept

¹ J. C. Lowe, "An Economic Analysis of the Teletype Hog Marketing System in Manitoba Canada," (unpublished Master's thesis, the University of Wisconsin, Wisconsin, 1968).

of Samuelson's spatial equilibrium model² will be employed.

Samuelson's model deals with the price differential for a homogeneous commodity between any possible pair of markets. The model states that the price differential just equals the transportation cost between two markets. This study is based on an analysis of the hog price differential between Toronto and Winnipeg. There is no legal restriction on inter-market trade. A substantial shipment is made from Winnipeg to eastern Canada in the form of hog carcasses. The price differential for hog carcasses between two markets could be estimated by Samuelson's model. However, the interregional shipment of live hogs is severely inhibited by the potential shrinkage and bruising from shipping live hogs and by added feed costs and delayed returns. The price differential for live hogs between two markets is not necessarily determined by the transportation cost for live hogs. In this case, Samuelson's model should be modified. The modification of the spatial price equilibrium model will be discussed in detail later on.

Following the development of a suitable model for estimating the effect of teletype selling on prices, empirical analysis will be applied to test the theoretical hypotheses. The technique of the Student-T Test will be employed to test the identification of the periods' average price spreads between Toronto and Winnipeg with the transportation costs. The technique of the Sign-Test will also be employed to examine the frequency distribution of weekly and monthly net price spreads.

²P. A. Samuelson, "Spatial Price Equilibrium and Linear Programming," American Economic Review, Vol. 42 (1952), pp. 283-303.

II. THE SCOPE OF THE STUDY

Use of Inter-market Price Differential as a Basis of Estimating the Effect on the Price Level

There are several techniques which could be employed to estimate the effect of a selling method. For example, it is supposed that the hog price variations are due to differences in selling methods, and in supply and demand conditions. In other words, price is a function of demand, supply, and selling method. Mathematically speaking $\hat{P} = f(D, S, SM)$ where \hat{P} is the estimated hog price in a particular market; D, S, SM represent the demand, supply and selling method respectively. Using these variables (the selling method can be replaced by a dummy variable)³ and fitting a suitable model such as Wold's recursive model,⁴ the price functions could be formulated. From the regression coefficient of selling method (or the regression coefficient of the dummy variable) on hog prices in the estimated function, the effect of the teletype system on the price level could be estimated.

This approach was thwarted by the size of the errors in estimating. The effect of the teletype selling system on hog prices are likely to be the order of less than 5 per cent of unit hog price. Prices estimated by a recursive model are likely to be subject to errors of estimation much larger than the probable effect on prices. This would

³J. Johnston, Econometric Methods (New York: McGraw-Hill Book Co., 1963), pp. 221-8.

⁴V. I. Sorenson, Agricultural Market Analysis (Michigan: Michigan State University, 1964), pp. 234-6.

make it impossible to detect any significant effect of the selling method. Therefore, this method is not suitable for this study.

Again, it is presumed that price is a function of demand, supply, and selling method. The effect of a change in demand for hogs and/or a change in hog supplies on prices in one market, under the conditions of perfect competition in space, would be quickly transmitted to other markets. During the thirty-month period, December, 1958 to May, 1961, preceding the alteration of the selling mechanism in Toronto, the secular trends of hog prices both in Toronto and Winnipeg have been estimated for this study.⁵ The technique of the analysis of variance has also been employed to test homogeneity of these two long-time movement patterns. The result of the empirical analysis indicates that these two secular trends are statistically homogeneous (see Table XIII). During the same period, the types of seasonal variations of hog prices in both markets are nearly the same (see Table IX). This evidence, the homogeneity of the long-time movements and the short-time changes in hog prices in two markets, indicated that the effect of the demand-supply changes on price was transmissive. The magnitudes and directions of the price variations in the two markets are consistent.

Alternatively, the effect of the teletype system on hog prices in Toronto would not, at least under a certain limitation, be transmitted to Winnipeg. (This point will be discussed in detail in Chap-

⁵The secular trends are: $P = 23.54 + 0.12 t$, and $P = 20.91 + 0.14 t$ in Toronto and Winnipeg respectively. Base period = December 1958; t unit = one month.

ter III.) If the foregoing assumptions are valid, then the effect of teletype on the hog price differential between markets would not be disturbed by, or could be isolated from the effect of demand and supply changes on hog prices. Therefore, the effect of teletype on the level of hog prices could be estimated by analyzing inter-market hog price differentials, previous to and following the selling mechanism change. The inter-market price spread will be used as a basis of estimating the effect on the price level for this study.

Potential of Price Differentials Between Toronto and Winnipeg as a Basis for Calculation of Price Level Effect

From the study of market data for 1957 to 1966 (see Table X), it is evident that about two thirds (68 per cent) of the hogs received by the packing plants in Manitoba are supplied by producers within the Province and one third are imported from other Provinces, especially from Saskatchewan (27 per cent) and Alberta (5 per cent). The whole Prairie region can be considered as a single large market for live hogs. The effect of the teletype system on hog prices in Winnipeg would probably be quickly transmitted to other Prairie areas.

On the other hand, more than 99 per cent of the hogs slaughtered in Ontario are produced in that Province (see Table XI). Losses may occur to those seeking to profit by arbitrage between the Winnipeg and Toronto markets because of the long rail or truck journey. In the transportation of live hogs, it is possible that extra shrinkage or injury will occur which will be evident at the time of weighing and

grading of the carcass. Only a negligible amount of live hogs (less than 1 per cent of Manitoba production) is shipped from Manitoba to Ontario.

Table I shows that, on the average over the period from 1957 to 1966, 756 thousand hogs were slaughtered in Manitoba. The Canadian warm dressed weight of each hog averaged 161 pounds. Under the assumption that the Manitoba dressed weight was the same as the national average, the total estimated slaughtered weight per year, on the average, was 122 million pounds. During the same period, the average population of Manitoba was 923 thousand. Average annual per capita pork consumption for Canada was fifty-one pounds in terms of weight of wholesale cuts. The total estimated Manitoba pork consumption would be 57 million pounds, assuming the Manitoba consumption was the same as the national average. This is equivalent to 47 per cent of the total volume of hogs slaughtered in the Province. It is concluded that approximately 53 per cent of the hogs slaughtered in Manitoba moved eastward in carcass form. No figures are available to indicate how many of these carcasses were shipped to Ontario, but it is believed that the number was substantial.

The effect of teletype on the hog price spread between Toronto and Winnipeg and that between Winnipeg and Saskatoon would be different. In essence, the effect of teletype on separated live hog markets and that on non-separated live hog markets would not be the same.

In the first situation, the inter-market hog shipments are normally made in the form of carcasses. The average live hog price difference between Toronto and Winnipeg, under the assumption that the

TABLE I

ESTIMATE OF HOGS EXPORTED FROM MANITOBA, 1957-1966

Years	No. of slaughter hogs ^a (1000 head)	Dressed weight per hog ^b (lbs.)	Total slaughter weight (million lbs.)	Canada per capita consumption ^c (lbs.)	Mani-toba population ^d (1000)	Estimated total consumption (million lbs.)	Total consumption in terms of dressed weight (million lbs.)	Estimated surplus for export (million lbs.)
1957	620.9	163.4	101.4	46.2	862	39.8	48.5	52.9
1958	850.6	163.8	139.3	51.7	875	45.2	55.1	84.2
1959	1,111.5	160.9	178.8	58.4	891	52.0	63.4	115.4
1960	764.4	159.1	121.6	55.3	906	50.1	61.1	69.5
1961	756.6	161.5	122.2	49.9	922	46.0	56.8	66.1
1962	682.3	160.7	109.5	49.8	936	46.6	56.8	52.7
1963	583.1	161.7	94.3	50.7	949	48.1	58.7	35.6
1964	748.2	160.6	120.2	52.0	959	49.9	60.9	59.3
1965	763.1	159.5	117.4	49.2	965	47.5	57.9	59.5
1966	709.0	161.5	114.5	47.7	963	45.9	56.0	58.5
Average	756.2	161.3	121.9 (100%)	51.1	922.8	47.1	57.4 (47.1%)	64.5 (52.9%)

^aDBS: #23-203, Livestock and Animal Products Statistics, 1966, p. 39.^bCanada Dept. of Agriculture, Livestock Market Review, Ottawa.^cDBS: #32-226, Apparent per capita domestic disappearance of food in Canada, Nov. 1967, carcass weight per capita per annum.^dDBS: #91-201, Estimated Population of Canada by Province at June 1, 1966.^eIncluding waste, shrinkage, and inedible parts, about 18% of the rail weight does not enter consumption. To convert total consumption to rail weight the figure must be multiplied by $\frac{100}{82}$.

wholesale marketing margins are the same in these two markets, is expected to be equal to the freight rates for meat. The effect of the Toronto teletype system on hog prices would not be transmitted to Winnipeg unless the price spread becomes large enough to cover the sum of the cost of transferring live hogs plus the allowances for shrinkage.

Conversely, during the period studied, an average of approximately 27 per cent of the hogs slaughtered in Manitoba or 36 per cent⁶ of the hogs produced in Saskatchewan were shipped from Saskatchewan to Manitoba in the form of live hogs. The average live hog price difference between Winnipeg and Saskatoon is expected to be nearly equal to the freight rates for live hogs between these two markets. The effect of the new selling mechanism on hog prices in Winnipeg would probably be quickly transmitted to Saskatoon by the diversion of deliveries from Saskatoon to Winnipeg.

Figure I illustrates inter-market price relationships, assuming the freight rates for live hogs between Winnipeg and Saskatoon equals OT, were equilibrated at P_{wo} and P_{so} before teletype was started in Winnipeg. After teletype was introduced, presuming the Winnipeg teletype system had a significant effect on hog prices, the Winnipeg packer was forced to pay a higher price up to P_{wl} at the given volume of hog supply in Manitoba, TQ_{wo} . The higher price in Winnipeg would encourage producers

⁶ From 1957 to 1966 on the average, 569,941 head of hogs produced annually in Saskatchewan. Of these, 205,801 head were shipped to Manitoba. (Data from Canada Dept. of Agriculture, Livestock Market Review, Ottawa).

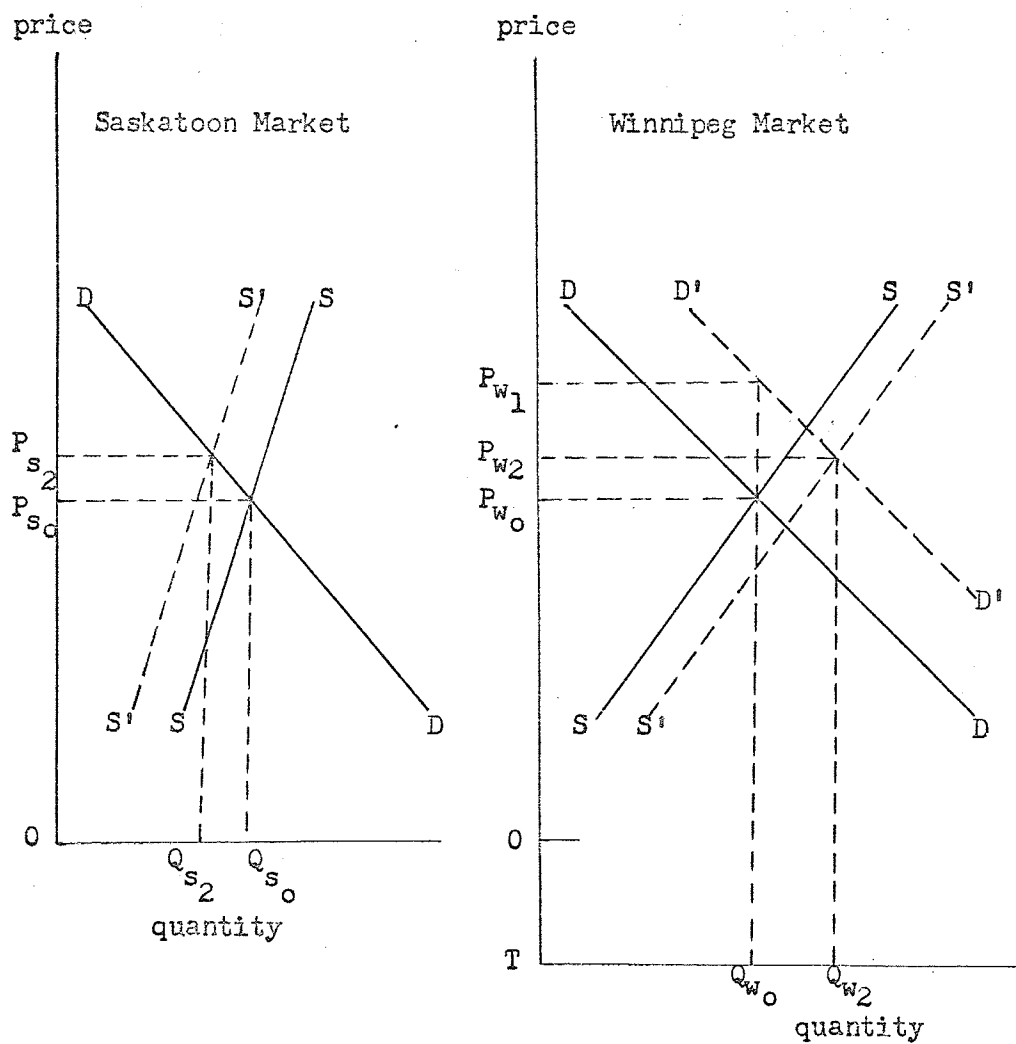


FIGURE 1

THE HYPOTHETICAL PRICE DIFFERENTIAL
BETWEEN WINNIPEG AND SASKATOON

to ship fewer hogs to Saskatoon and more hogs to Winnipeg. The volumes of hog supplies and hog prices in these two markets would ultimately adjust themselves to the same flows to market at the higher level of price in these two markets at P_{w2} and P_{s2} . The result would be a continuation of the Winnipeg-Saskatoon price spread at the level of the transportation cost for live hogs.

Actually, the average hog price differential between Winnipeg and Saskatoon for the forty-months period March, 1965 up to June, 1968 was ninety-nine cents per hundredweight.⁷ During the same period the freight rates for live hogs between these two markets was ninety-three cents per hundredweight.⁸ The net price spread was six cents per hundredweight. The Student-T value of the net price spread was equivalent to 0.066. It is concluded that, after teletype was adopted in Winnipeg, the Winnipeg-Saskatoon price spread was not significantly different from the cost of transferring hogs. In essence, the effect of teletype has been transmitted to the Saskatoon market. In this case, it is impossible to use the inter-market price spread to estimate the effect on the price level, since the magnitude of price spread, when there is perfect competition in space, is largely determined by the transportation cost.

This study is limited to the former situation, the Toronto-

⁷ During the period studied, the Grade A average dressed hog prices were \$31.16 and \$30.17 per hundredweight in Winnipeg and Saskatoon respectively.

⁸ Source: DBS #23-203, Livestock and Animal Products Statistics.

Winnipeg price differential, though the Winnipeg teletype system may well have had some effect on Saskatoon hog price levels.

Time Period of Analysis (December 1958 to June 1968)

Before the establishment of the teletype system for selling hogs in Manitoba, there were two main ways of handling farmer's hogs. One was to unload the hogs in public stockyards and subsequently for a commission firm to sell them by private treaty. The other was for the producer to ship hogs directly to one of the packing plants without any prior arrangement between the producer and the packer. Actually, all hogs were sold by private treaty. There were no regulations to direct hogs through particular channels.

As described in the previous Chapter, the history of hog marketing in Ontario during the last several decades can be divided into different stages. Prior to 1953, there were three main methods of selling hogs. The producers were free to choose any available method for selling their hogs. The single sales agency method of selling and the compulsory direction of hogs to specific assembly points which commenced during January 1953 and September 1957 respectively, did not come into effect immediately over the entire Province. On July 25, 1958, hog producers were given an opportunity to vote on the continuation of the then existing hog plan. The result of that plebiscite indicated that the majority of producers were in favor of the principle of the plan.

Based on spatial equilibrium theory, the magnitude of the price spread is largely determined by the transportation cost. In addition to the mentioned hog marketing changes, when the starting point of the

time period for this study is chosen, attention must be given to changes in the cost of transportation.

No figures are available to indicate the volume of meat shipments from Winnipeg to eastern Canada, carried by the various transportation modes. On the basis of the criterion that

. . . traffic be allocated to any form of transport whose full costs are less than the nearest competitor's marginal or average variable costs. . . . In the case of high-value commodities, both carload and rail piggyback operations have a substantial advantage over package freighters and truck operations.⁹

On a theoretical basis, it would be expected that in most cases the meat is shipped by rail rather than by truck.

Due to the development of the truck industry, the competition between modes of transportation has become more sharp. Since 1921, the freight rates for meat from Winnipeg to Toronto by rail have been raised gradually and reached a peak point in December 1958. Since that date the freight rates have been reduced (see Table XII).

Professors Thomsen and Foote advised a choice of "a known factor tending to produce a general upward, downward, or lateral movement of the variable over a period of time"¹⁰ as the starting point of a study. Due to a reduction in freight rates, the Toronto-Winnipeg price differentials are expected to be narrowed. Accordingly, December 1st, 1958,

⁹J. R. Meyer, M. J. Peck, J. Stenason and C. Zwick, The Economics of Competition in the Transportation Industries (Cambridge, Massachusetts: Harvard University Press, 1964), p. 166.

¹⁰F. L. Thomsen, and R. J. Foote, Agricultural Prices (New York: McGraw-Hill Book Co., 1952), p. 317.

the time of the reduction in the freight rates for meat was chosen as the starting point in this study.

The teletype auction has been in operation for only a limited time. It is desirable to observe the price series data as long as possible. The end of the time period for this study has been extended to the latest possible date. The first draft of this study was finished in June 1968 and then the nearest possible data was the week ending on June 8th, 1968. That date has been selected as the end of the period for this study.

The time series of price spreads between Toronto and Winnipeg from December 1958 to May 1968 will be divided into three sub-periods, i.e.,

Period I: from December 1, 1958 to May 7, 1961.

Period II: from May 8, 1961 (when Toronto set up teletype) to February 24, 1965.

Period III: from February 25, 1965 (when teletype was established in Winnipeg) to May 31, 1968.

Prior to September 1957, the date of commencement of the compulsory direction of hogs to specific assembly points in Ontario, the Toronto-Winnipeg price differential was generated under conditions where neither market was affected by direct substantial Board intervention to direct hogs through particular channels or to introduce or impose competitive bidding among buyers. Based on Samuelson's model,¹¹ the price spread

¹¹ Samuelson, op. cit.

between two markets is expected to be equal to the transportation cost.

In Period I, nearly all Ontario-raised hogs were directed to and sold through the Ontario Hog Producers' Co-operative, the selling agent of the Ontario Hog Producers' Marketing Board, on the basis of private treaty by telephone. During the same period, all of Manitoba hogs were sold without direction by private treaty by producers, truckers, and commission firms.

"To be highly competitive, either there must be several buyers present or the seller must be as well informed and as skilled in bargaining as is the buyer."¹² Even though the Board controlled 100 per cent of marketing hogs in Ontario, in using the private treaty method, the selling agency may have been unable to sell hogs at prices which represented their full market values. The 100 per cent control of selling channel for marketing hogs may be a necessary condition for raising hog prices, but not a sufficient condition. If the price spread between Toronto and Winnipeg, after compulsory direction of hogs was instituted, were greater than it was before, it would imply that there was a significant effect of compulsory direction of hogs on price level. Otherwise, the effect of 100 per cent control of hogs on the price level was not significant.

The comparison of the Toronto-Winnipeg price differential previous to, with that subsequent to, the introduction of compulsory direction of

¹²Select Committee of the Legislative Assembly of Manitoba, Live-stock Marketing in Manitoba (Winnipeg: Queen's Printer, Feb. 1964), p. 160.

hogs in Toronto will not be made. It is assumed that the effect on price level of 100 per cent control of hogs, without a change in the selling mechanism, is not significant and the price spread, during period I, is expected to be equal to the transportation cost between these two markets.

At the beginning of Period II, the compulsory teletype auction method of selling hogs was established in Ontario. During period II, as well as the previous period, all of Manitoba-raised hogs were sold by private treaty. The price spread between Toronto and Winnipeg in period II would be different from that in period I if the teletype system in Toronto had a significant effect on price.

In Period III, the compulsory teletype auction method of selling hogs was still used in Ontario. During that period, the voluntary teletype system was used in Manitoba. About two-thirds of Manitoba hogs were sold through teletype auction. The other one-third was sold by private treaty. The comparison of the effects of the compulsory teletype system and voluntary teletype system will be made in another research project. In this study, it is assumed that there is no significant difference between the two kinds of teletype auction.

Weekly and Monthly Grade A Dressed Hog Prices as the Basis for Analysis

Due to the lack of uniformity of weight, variation in degree of finish, and difference in type, the volume of Canadian bacon on the British market dwindled from a high of 240 million pounds in 1919 to a low of approximately 11 million pounds for 1931. This brought sharply into focus the realization of the weakening position of Canadian bacon

in the United Kingdom market resulting from the quality of Canadian hogs. From 1930 to 1934, considerable experimental work was done in developing a carcass grading system for hogs. This had been preceded by an experimental project at a Toronto plant in the fall of 1928.¹³ In 1931, the Joint Swine Committee recommended that consideration be given to: (1) the compulsory settlement for all hogs on the basis of official grading; and (2) a system for the carcass grading of hogs. In 1932, P.C. 132 was passed. This required the packer as well as the shipper to purchase according to grade, and was adopted by all Provinces. On September 30, 1940, P.C. 4470 established carcass grading as the only official method of grading hogs.¹⁴

Since that time, the buyer has not had to see the product to determine the quality. The price of the top grade is now taken as the basic price for bidding purposes before slaughter and the prices of most lower grades are separated from it by fixed amounts. For example, if the grade A dressed hog price is \$30.00 per hundredweight, the grade B hog price is \$1.00 per hundredweight less, or \$29.00.

The producers' hog price (or teletype price) which indicates the price at slaughtering plant per hundredweight of carcass received by producers will be used as basic data for the analysis of price level effects of teletype.

¹³H. J. Mayhee, Hog Grading in Canada (Canada Dept. of Agriculture, Publication No. 961, Ottawa, 1962), p. 10.

¹⁴Ibid., p. 37.

The primary hog price data consists of the unit price paid for individual hogs or lots of hogs at a given time and market. These prices are summarized into statistics of daily weighted average prices and total quantities sold. This daily information is resummarized into statistics of weekly, monthly, and yearly average prices which are published by Canada Department of Agriculture.

During the period studied, all of the market hogs in Ontario were sold through the Hog Marketing Board and there was only one mechanism establishing price for the whole Province. In Manitoba, there are two main methods of selling hogs. Consequently, there are two kinds of hog price data. One is the public market hog price and the other is the hog price for direct sales. The published price data represent the price levels at the public markets only.

The average level of hog prices will be analyzed for this study. If the data are not correct, it is difficult, if not impossible, to draw accurate conclusions. There is a problem in determining the true means of the hog prices in the markets. Theoretically, there are two alternative ways to estimate the true means, i.e., (1) to observe the price for every sale and to calculate the weighted average price; or (2) to take a sample which is representative of the population and to deduce the average price for the population from the sample mean. Usually, the first method is thwarted by the difficulty in collecting the necessary data.

It is believed that the average public market price or the average teletype price is a good indicator for the general level of hog

prices. This belief lies in the fact that the negotiation for hog prices between the packer and the farmer or his selling agent are heavily dependent upon the prices which are established in the public market. For example, there was only one cent difference in the average teletype price and the average direct sale price for the month of January, 1967. It is fair to say that the public market price is a good indicator for the general price level (see Table II).

The next question is how to select representative prices from daily, weekly, monthly, and yearly averages as a basis for analysis. Usually, annual data are suitable to use for a longer period analysis. In this study, each sub-period includes only two or three years, hence annual data are not suitable. Daily prices are suitable for the analysis of price variation in the short run, e.g., day to day, week to week. It does not appear to be necessary to use minute data to compare price levels.

Weekly and monthly average prices will then be used for this study. It is expected that the same results will be obtained using either weekly or monthly data but the two results may provide a check for each other.

TABLE II

COMPARISON OF THE TELETYPE AND THE DIRECT SALES
PRICES IN WINNIPEG FOR JANUARY 1967*

Date	Teletype Price P_t	Direct Sale Price P_d	Difference $P_t - P_d$
Jan. 3	\$29.19	\$29.20	-1¢
4	27.93	27.99	-6
5	28.45	28.45	0
6	28.13	28.15	-2
9	29.28	29.26	2
10	29.43	29.45	-2
11	29.46	29.43	3
12	29.50	29.48	2
13	29.66	29.65	1
16	30.12	30.10	2
17	30.95	30.95	0
18	30.60	30.60	0
19	31.25	31.26	-1
20	29.99	30.07	-8
23	29.42	29.40	2
24	29.29	29.30	-1
25	29.25	29.25	0
26	29.50	29.63	-13
27	29.77	29.76	1
30	30.55	30.55	0
31	30.50	30.55	-5
Average ^a	29.63	29.64	-1

*Source: Manitoba Hog Marketing Commission.

^aSimple average prices per hundredweight.

CHAPTER III

THEORETICAL BASIS OF THE STUDY

I. EVALUATION OF THE TELETYPE AUCTION WITH RESPECT TO PRICE LEVEL¹

The purpose of establishing the teletype selling system was, presumably, to enhance the gross income of the producer by increasing the price received per unit. The apparent advantage to the producer under the new selling method as compared to the old methods will be discussed.

Theoretically speaking, there are at least six characteristics on which the performance of a hog marketing channel can be judged. These are competitiveness, cost, speed, equity, convenience, and degree of freedom.² The last three factors are not involved in the appraisal of prices and are beyond the scope of this study. The former three factors are relevant to the price level and will be discussed in detail.

Competitiveness

The competitiveness of a selling method is its most important characteristic. It has potentially the greatest effect on net returns to the producer. In a teletype auction, all buyers and sellers are present at a sale as they are for the traditional non-mechanized auction, such

¹ This section draws heavily upon Select Committee of the Legislative Assembly of Manitoba, Livestock Marketing in Manitoba (Winnipeg: Queen's Printer, Feb. 1964).

² Ibid., p. 159.

as the country livestock auction in Alberta.³ Auctions provide an equal opportunity for all buyers to bid on all lots. However, the teletype system is more competitive than the public market auction ring system.

In the public market auction, the buyers bid prices which progress from low toward higher levels. Buyers in such auctions may be able to take advantage of imperfect competition in the market to buy hogs at less than a perfectly competitive price. A hypothetical example will demonstrate this point. Suppose a packer, namely packer A, judges a particular lot of hogs, from the market information, is worth \$30.00 per hundredweight. He makes up his mind to bid up to \$30.00 in the public market. Assume that \$28.00 per hundredweight has been determined as the initial asking price by the selling agency, and the nearest competitor has bid \$28.75. In this case, packer A could buy the lot of hogs by paying a little higher than \$28.75, say \$29.00. The producer does not get the highest possible price unless at least one of the rivals bids the price close to \$30.00. In a teletype auction, hogs are offered at successively lower prices. When \$30.00 appears on the teletype buying machines, packer A probably would press his buying button at that time since he would not know that nobody else would bid a price higher than \$28.75. Consequently, the producer would receive a higher price under the system of declining price offers.

The other disadvantage of the public market auction is that "the

³ T. W. Manning, Country Livestock Auction and Market Performance (University of Alberta, Edmonton, Sept., 1966).

small buyers can be discouraged from bidding aggressively."⁴ When a small buyer hopes to get more hogs and to bid a higher price, the reaction of the large firms might be to bid up the price to force the aggressive bidder to pay a still higher price. If the small buyer is unable to pay the extra high costs, he will be compelled to give up the price competition in the auction. In this case, hog prices are influenced by the bidding manipulation of the large firms.

In a teletype auction, a small buyer has an equal chance with the large firms to bid for hogs. The large firms are unable to prevent the small buyer from bidding aggressively except by buying all lots offered at higher prices. In general, each packing plant wants to buy enough hogs to achieve an efficient operation with the existing scale of plant. So, it is expected that, due to more aggressive bidding, the packers will be forced to pay a higher price than they do in the public market auction.

In Ontario, previous to the inception of the teletype system, the sales committee of the Co-operative used marketing information as a basis on which to determine the asking prices. Following that step, the sales staff contacted the packers individually by telephone to get bids. During the process of receiving bids the agency was the only salesman. At the discretion of the agency, the hogs were distributed among all packers who bid the same price. Under that system the packers accused the Board of frequently allocating hogs quite arbitrarily.⁵

⁴Livestock Marketing in Manitoba, p. 168.

⁵Ibid., p. 91.

Meanwhile, there was a fear that the agency might overreach itself once it obtained possession of a high percentage of hogs through the assembly points. Hogs must be slaughtered when they are ready for market, or there will be an appreciable deterioration of value and reduced revenue due to shrinkage and/or increased feed costs. In this constricted situation, the Board may have to sell hogs to the packers at a lower price than it considers appropriate under current demand and supply conditions.

The major advantage of the teletype system is that all lots of hogs at every location are simultaneously offered to all potential buyers. Each buyer has the same opportunity to become the highest bidder simply by being the first to press the bidding button. It is apparent that unrestricted opportunity for processors to bid competitively on each and every offering at all locations, makes possible a highly effective degree of competition for available supplies, and permits a continuous sensitive adjustment to changes in demand and supply conditions. This ensures that the producer's hogs are sold to the highest bidder.⁶

In a teletype auction, discrimination among sellers (those delivering hogs to assembly points in various locations) would be impossible. All buyers have a chance to bid on every lot of hogs offered for sale. This also helps to insure more competitive bidding on hogs. Kohler stated that, "every processor and buyer has become more conscious

⁶ Meat Packers Council of Canada, A Letter on Canadian Livestock Products (No. 4, 1961, Toronto, Ontario).

of his delivered cost under this (teletype) system of selling."⁷ There are perhaps two main reasons which lead to this change. These are:

(1) the existence of a significant intraday price fluctuation associated with the teletype system; and (2) the increase in delivered cost relative to the wholesaling margin.

According to Kohler, before the introduction of teletype, owing to the uniformity of bids, a lot of hogs were traded at the same price by the majority of packers.⁸ Under the F.O.B. pricing system used by the Ontario Marketing Board, according to spatial equilibrium theory, it is reasonable to assume that a packer will bid different prices for hogs in various assembly yards. The difference in prices between two yards will tend to remain constant at the level of cost difference in delivering hogs to his plant from two various points. In this case, most packers would probably buy hogs at the yards closest to their plants.

After teletype, according to the primary analysis of the effect of the teletype selling system on short-run price variation in Manitoba, from sale to sale within the day and from day to day, hog prices have become more flexible.⁹ It is probable that the effect of teletype on short-run price variation in Ontario would be the same as it has been in

⁷J. R. Kohler, Report by General Manager (Annual Meeting, Ontario Hog Producers' Co-operative, Toronto, Sept. 14, 1961).

⁸Ibid.

⁹In Manitoba, the coefficient of variation ($\frac{S}{\bar{X}}\%$) for daily hog prices was 4.5 per cent in 1964 (before teletype) and was 16.3 per cent in 1967 (after teletype). These figures are drawn from C. M. Lu, "The Effect of Teletype Selling System on Short Run Price Variation," (An unfinished Master's thesis, University of Manitoba).

Manitoba. In order to minimize the purchase price plus delivery charge for the purchased hogs, it is quite possible for a packer to buy hogs at a yard far from his plant when the price is low enough to cover the extra delivery cost.

The opportunity for all buyers to bid on every lot of hogs offered for sale and the increased price variation in the teletype system will probably direct the packers' attention to the delivery costs for hogs to his plant from various yards.

Secondly, after teletype, the wholesaling margins have become narrower. (This point will be discussed in detail in the next section.) Suppose the delivered costs for hogs, before and after teletype, are the same. After teletype, the delivered cost of hogs would form a higher proportion of the packer's selling price than it was before teletype. The cost of the live animal would become a relatively more important item in total cost.

Owing to the packer becoming more conscious of his delivered cost, more producers would deliver their hogs to the assembly yards which are close to slaughtering centers, since, in this way, transportation charges would be minimized and net receipts maximized. Alternatively, the processors would bid a higher price for hogs which are located at a greater distance, if the extra payment was less than the extra transportation charges for shipping hogs to their plants from the assembly yards located at country points. Both cases would result in a higher average return per hog to producers.

Similarly, at the present, seven out of eight major packing plants

in Manitoba are located in St. Boniface, within metropolitan Winnipeg, closer to the final consumer market. One major packing plant is located at Brandon. The two centers are a substantial distance apart, Brandon being about 130 miles farther from the final market than is Winnipeg. Under the F.O.B. pricing system used in the teletype auction, most processors would prefer to buy hogs from the Union Stock Yards in St. Boniface if prices were the same. The prices in St. Boniface would logically be higher than those in Brandon.

In Manitoba, before the inception of the teletype system, many farmers' hogs were sold by truckers who picked up hogs at country points and delivered them to processors on behalf of the producers. The producer had the right to instruct the Public Service Vehicle trucker to deliver his hogs to a specific commission firm in the public market or to a particular plant.

No figures or analysis are available to indicate the percentage of the hog growers who instruct the truckers to deliver to specific firms in Manitoba. According to Rackham's survey,¹⁰ more than 80 per cent of Ontario hog growers did not instruct the trucker to deliver their hogs to any particular plant or commission firm. Similarly, it is probable that most Manitoba hog producers did not know, at the time the hogs left their farms, where or to whom the hogs would eventually be sold. In essence, a lot of livestock could be delivered to any plant at the

¹⁰ T. S. Rackham, Hog Marketing in Grey Country, Ontario, April, 1950 (Dept. of Agriculture, Ottawa, April, 1952), pp. 13-4.

discretion of the trucker. In this case, a packer might pay a worthwhile bonus to truckers to induce them to ship farmers' hogs to his plant.

"The bonus might come out of the shipper's receipts through a lower price for the livestock delivered."¹¹ If this happened, it would not be surprising if the prices received by farmers were relatively lower than they would have been in a perfectly competitive market.

In 1965, a voluntary teletype system was established in Manitoba. The commission levies thirty cents per hog on all hogs of Manitoba origin. The method of selling hogs through a commission firm, located in the public stockyards, has been abandoned voluntarily. This was to be expected since there would be nothing to gain in paying extra public market charges in addition to the thirty cents. At present, only two main market channels exist. Based on the last three years' records, about 60 per cent of Manitoba-raised hogs were sold through the voluntary teletype auction. The substantial percentage of the hogs marketed by teletype ensures a competitive market which acts as a price setter in the Province.

The alternative selling method is through the hog producers themselves consigning or delivering and selling directly to the packing plant. After the introduction of the rail grading system, a farmer no longer had to be a good judge of the quality, dressing percentage and weights of hogs. In most cases, the buyer's skill and knowledge is superior to that of the producers many of whom produce relatively small numbers of

¹¹ Livestock Marketing in Manitoba, p. 165.

hogs. Direct selling is seriously lacking in competition since the producer may not be very well informed about current market prices. He also is often not a good bargainer even if he is well informed.

In the annual report of the Commission, during the week ending March 18th, 1966, 8105 head of hogs were sold by 1310 producers who patronized the teletype system. The average number of hogs per consignment equaled 6.2 head. Meanwhile, 4907 head were sold by 509 producers direct to packers. The average number of hogs per consignment was 9.6 head.¹² The frequency of sales by the producer who sells directly to packers is probably greater than that by those who patronize the teletype system. It is believed that the farmers who produce larger volumes of hogs prefer the private treaty method to selling by teletype auction. The large hog grower here is defined as one whose income largely comes from selling hogs. These producers are more likely to have adequate information respecting the current market situation and higher than average bargaining skill.

Even if the producer himself is nearly equal to the buyer respecting both bargaining skill and market information, the hog price offered is more or less based on the price established by the public market. The teletype system is more competitive in bidding than is the public market, where commission firms negotiate hog prices with the packers privately. If this statement is valid, then after the establish-

¹²

Manitoba Hog Marketing Commission, Annual Report, March, 1966.

ment of the teletype selling system, the general price which was set by the teletype would be higher than that set in the public market. As a consequence, the private treaty method of selling hogs, negotiating between individual farmer and the packer, would tend to be higher, too.

Cost of Marketing

Net returns to producers equal the hog price minus the costs of marketing. The lower the costs, ceteris paribus, the higher the net returns would be. Since it began operations, the Ontario Board, according to its financial situation, has levied variously from forty cents to fifty-one cents per head. The Manitoba Commission levies thirty cents per hog for all marketed hogs. Based on these two single figures, it is hard to evaluate the efficiency of the teletype system respecting the costs of marketing. It is better to evaluate by comparing the potential costs of various marketing items among the alternative marketing channels.

The Select Committee of the Legislative Assembly of Manitoba noted that "the costs of marketing through different channels is largely a reflection of the physical efficiency with which the function of assembly, transportation, and selling, are carried out."¹³ Following this definition, it is assumed that the components of the marketing costs are the costs of transportation, physical facilities, and selling costs. An approximate comparison of these costs for each marketing channel such as by direct sales, by commission agency, and by teletype auction can be made.

¹³Livestock Marketing in Manitoba, p. 160.

Transportation costs are defined here as the costs of transferring hogs from farm to packing plant. In selling by producers themselves, the hogs may be shipped directly to plants, to buying stations or to private yards. The transportation cost need not be minimized in this way. If the farmer's hogs are shipped by truckers and sold directly to plants, the producers have to pay trucking charges at regulated rates which include the trucker's profit. This may cost less than if producers delivered their own hogs. In selling through commission firms as well as teletype auction, the hogs are unloaded at the assembly yards first (except that about 40 per cent of teletype auction hogs in Manitoba are sold "On car or truck en route"). After completing the negotiation between the selling agent and packers, the hogs are reloaded for shipping to plants. As a consequence, additional handling costs are incurred. To the extent this occurs under the teletype system, transportation costs are increased.

Concerning the costs of physical facilities, if the farmer's hogs are sold through the Commission firms located at the stockyards, the farmers have to pay yardage of fifteen cents per head and insurance against fire at one-third cent per head. They may also pay the cost for bedding hogs, \$1.00 per pen per night.¹⁴ When the hogs are sold through teletype auction, the farmers also have to pay the costs mentioned as part of the levy on all hogs. In a teletype auction, electronic bidding replaces personal negotiation. Each sale is usually completed in less than thirty seconds. The hogs can be sold quickly and this minimizes

¹⁴Id., p. 265.

the time hogs are held in the yards. Feed costs do not depend on rapidity of sale. In the case of direct sales, the producers avoid paying the costs of yardage directly. If the price the farmer receives at the plant is lower than that in public market by the amount of yardage, they pay for it indirectly.

In regard to the costs of selling: if the hogs are sold through truckers, the producers may pay truckers implicitly or indirectly for the service of performing the selling function on their behalf. No evidence is available to show the amount of implicit payment, but it is possible that the amount is greater than the recognized selling commission. In the public market, the selling commission rate for small lots was thirty cent per head (if over 250 pounds, seventy-five cent per head). The commission rate for straight carloads was \$20.00 plus ten cents per additional one hundred pounds over 16,500 pounds.¹⁵ In the teletype method, the selling function is performed by electronic auction and considerably less labour is required to negotiate sales. The payments for staff salaries of the Board or the Commission should be moderate though the cost would almost certainly be higher than for direct deliveries.

The buyer's time is valuable. The selling cost will be affected by the buyer's time. The larger the volume of buying within a unit time, the lower the cost of buyers' salaries. Usually, an individual farm has only a small number of hogs to sell. Purchase in small lots will require more of the buyer's time. In contrast, in a teletype auction, a buyer

¹⁵Ibid., p. 264.

does not need to spend much time in bidding.

Considering the over-all costs of marketing by different methods, costs by teletype should be lower than by selling through truckers and through commission firms. It might be higher than for direct sales by producers. However, the higher cost could be offset by the advantage of a more competitive selling mechanism.

Speed

Under the rail grading system, hog producer's revenue is determined by the unit hog price and the carcass yield of animals. Price itself is affected by hog grade which is determined by a government grader. However, the hog quantity and quality are partially influenced by the speed with which hogs move through a marketing channel from a farm to a slaughtering plant. If hogs are shipped in a manner to minimize time enroute, the shrinkage, injury, and bruising from the movement will be a minimum. This helps to insure the carcass will be of the highest quality and of maximum value per hundredweight. It also helps to maximize the carcass yield, also necessary in achieving maximum returns to producers. The question then is how to speed up the delivery process. The Select Committee of the Legislative Assembly of Manitoba suggested that, "to achieve maximum speed it is necessary to market livestock by as direct a route as possible."¹⁶

As mentioned previously, the compulsory direction of hogs to as-

¹⁶ Ibid., p. 160.

sembly points commenced in 1957 in Ontario. After the teletype system was introduced in the Province, the compulsory direction of hogs was continued. The packing plants are scattered over the Province and livestock are slaughtered at several points. In order to provide convenient points of assembly for all producers, forty-nine assembly yards were strategically located throughout the Province. The distribution of these yards' locations depend on the density of hog production and the location of packing plants but they may not result in minimum overall delivery costs.

Perkin reported, "a group of producers . . . were opposed to the marketing plan because they claimed the extra expense and excessive shrink experienced in shipping through assembly yards compared to shipping direct to plants made the plan too costly"¹⁷ A hypothetical diagram will be used to explain this statement.

In Figure 2, it is assumed that Farmer X is located near packing plant Z. From an economic standpoint, Farmer X should deliver his hogs directly to packer Z. Direct sale minimizes the possible losses from handling and enables the farmer to obtain top yield and top grade for his hogs. Under the teletype system and the compulsory direction of hogs, the hogs must be shipped from the farm to assembly yard Y, or other yards, where they are unloaded and mixed with other hogs and then reloaded. After the longer distance of shipment, a waiting period in the

¹⁷G. F. Perkin, Marketing Milestones in Ontario 1935-1960 (Toronto: Ontario Dept. of Agriculture, 1962), p. 59.

yard, and the extra unloading and reloading, the farmer may receive a lower yield and grade than he formerly did. As a consequence, the farmer's return may be reduced. In this particular case, the compulsory delivery to the assembly yard leads to unnecessary delays.

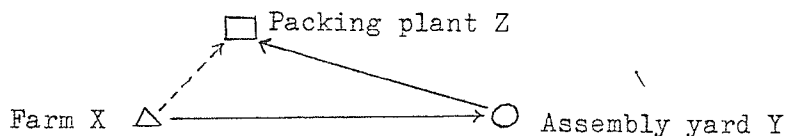


FIGURE 2

SPATIAL RELATIONSHIPS BETWEEN
ASSEMBLY YARD, AND PACKING PLANT

In Manitoba, two main methods of assembling and selling hogs are used by the Commission. These are: (1) individual consignments assembled into sale size lots; and (2) "On truck or on car (rail) en route" sales. The "en route" type of selling hogs has the advantages of both the teletype auctions and direct sales. In this method of assembly, the hog growers ship livestock to a packing plant directly. They may keep the handling costs to a minimum. On the other hand, because the teletype auction is more competitive in bidding, the producers may receive a higher price. The "en route" type of selling has become increasingly popular. During the fiscal period April 1966 to March 1967 approximately 35 per cent of all selling by the teletype auction was handled in this manner. In the 1967 fiscal year, 45 per cent of hogs sold through the teletype auction were sold in the same way.¹⁸

¹⁸Manitoba Hog Marketing Commission, Third Annual Report (Winnipeg, March 1968).

The "en route" selling method should perhaps be adopted in Ontario.

II. THE THEORY OF SPATIAL EQUILIBRIUM--A REVIEW OF SAMUELSON'S SPATIAL EQUILIBRIUM MODEL

As stated earlier, the price differentials between Toronto and Winnipeg will be used as a basis for estimating the effect of the teletype system on hog price levels. Theoretically, how large ought the price differential between two markets to be? This question can be answered by the theory of spatial equilibrium.

The first known attempt to analyze the effects of space on economic activity was made by Von Thunen in 1826. Other early basic location studies were written by Ohlin (1933), Hoover (1937), and Losch (1944).¹⁹ The greatest shortcoming of these pioneers' works is the fact they are "general" and incapable of handling specific problems in the real world. Since 1950, there has been a proliferation of studies in spatial economics.²⁰ In the meantime, other economists had begun to formulate operational models with simplifying assumptions which are capable of solution. Various spatial models of varying degrees of complexity have been developed. These approaches to the analysis of spatial price systems and

¹⁹ R. M. Leuthold and D. L. Bawden. An Annotated Bibliography of Spatial Study (Research Report 25, Experiment Station, College of Agriculture, University of Wisconsin, Aug. 1966).

²⁰ Ibid.

interregional trade structure were, more or less, derived from Enke's²¹ and Samuelson's²² works. The basic concepts of spatial equilibrium which are relevant to the price differential, will be reviewed briefly. Further, in order to meet the specific problem in this study, the modification of Samuelson's model will be made in the next section.

Enke's Formulation

In the general price equilibrium theory, it is assumed that both the sellers and the buyers are located at one market. In the real community, some areas are suited to produce certain commodities which in other areas would be unprofitable or impossible to produce under the restrictions of climate, resources, and institutional limitations. Conversely, these areas may be unsuited to produce other products which are required by the people within the region. Naturally, interregional trade or even international trade will take place.

In 1951, Enke²³ posed a problem concerning equilibrium among spatially separated markets. The problem involved is the following:

There are three (or more) regions trading a homogeneous good. Each region constitutes a single and distinct market. The regions of each possible pair of regions are separated--but not isolated--by a transportation cost per physical unit which is independent of volume. There are no legal restrictions to limit the actions of the profit-seeking traders in each region. For each region the functions

²¹Stephen Enke, "Equilibrium Among Spatially Separated Markets," Econometrica (Vol. 19, No. 1, Jan. 1951), pp. 40-7.

²²P. A. Samuelson, "Spatial Price Equilibrium and Linear Programming," American Economic Review (Vol. 42, No. 3, June 1952), pp. 283-303.

²³Enke, op. cit., p. 41.

which related local production and local use to local price are known, and consequently the magnitude of difference which will be exported or imported at each local price is also known. Given these trade functions and transportation costs, we wish to ascertain: (1) the net price in each region; (2) the quantity of exports or imports for each region; (3) which regions export, import, or do neither; (4) the aggregate trade in the commodity; and (5) the volume and direction of trade between each possible pair of regions. . . .

Enke demonstrates that it is mathematically possible to obtain a solution to this problem by using an electric circuit as an analogue.

The Basic Concepts of Samuelson's Spatial Equilibrium Model

In 1952, Samuelson,²⁴ proceeding from Enke's formulation, converted the transportation problem with demand and supply functions into a maximization problem of equilibrium analysis. He introduced the concept of Net Social Payoff (NSP) into the problem. He tried to determine what the final equilibrium price in each region would be and the corresponding quantities and flows involved in order to maximize the net social payoff.

Samuelson's model involves two basic concepts, i.e., (1) NSP will be maximized when the post-trade price differential equals the per-physical unit transportation cost; and (2) NSP will be maximized when the total transportation cost of all shipments is minimized. These two statements will be interpreted by the following steps.

(1) In a back-to-back diagram for two regions; Region A(R_a) and Region B(R_b), the horizontal axis of R_b , BG, is lower than that of R_a ,

²⁴ Samuelson, op. cit.

OA, by a vertical distance GO (see Figure 3). The amount of GO just equals the unit transportation cost between R_a and R_b (T_{ab}). If R_a and R_b were completely isolated, there would be no trade carried out. The prices of a particular commodity, namely good X, would be determined by the demand-supply conditions in each region. The equilibrium prices would be OP_a in R_a and GP_b or $GO + OP_b$ in R_b .

(2) If R_a and R_b are separated but not isolated, then the higher relative price in R_b makes the price differential greater than GO, and this would encourage the profit-seeking traders to ship good X from R_a to R_b . In R_a , the supply curve $S_a S_a$ will shift backward (decrease) to $S_a' S_a'$. The price goes up to OP_0 . In R_b , the supply curve $S_b S_b$ will shift forward (increase) to $S_b' S_b'$. The price falls to GP_0 in Figure 3.

The difference between the amount of demand and supply at any price is called the excess demand (ED) and the difference between the amount of supply and demand is called the excess supply (ES). The ED function of R_b (in terms of the right-hand quadrant) and the ES function of R_a have been drawn in Figure 3. These functions have their zero points which coincide with P_a and P_b , respectively. These two curves are like two forces pulling in opposite directions. They are balanced or in equilibrium at a particular price, if $T_{ab} = 0$, at which the amount of ED equals the amount of ES. In the equilibrium situation, $P_0 E$ units of the commodity will be shipped from R_a to R_b . Graphically, bb' , $P_0 E$, and aa' are identical in quantity. The equilibrium prices are established at OP_0 in R_a and at GP_0 or $GO + OP_0$ in R_b .

(3) The terminology of social payoff is defined by Samuelson as

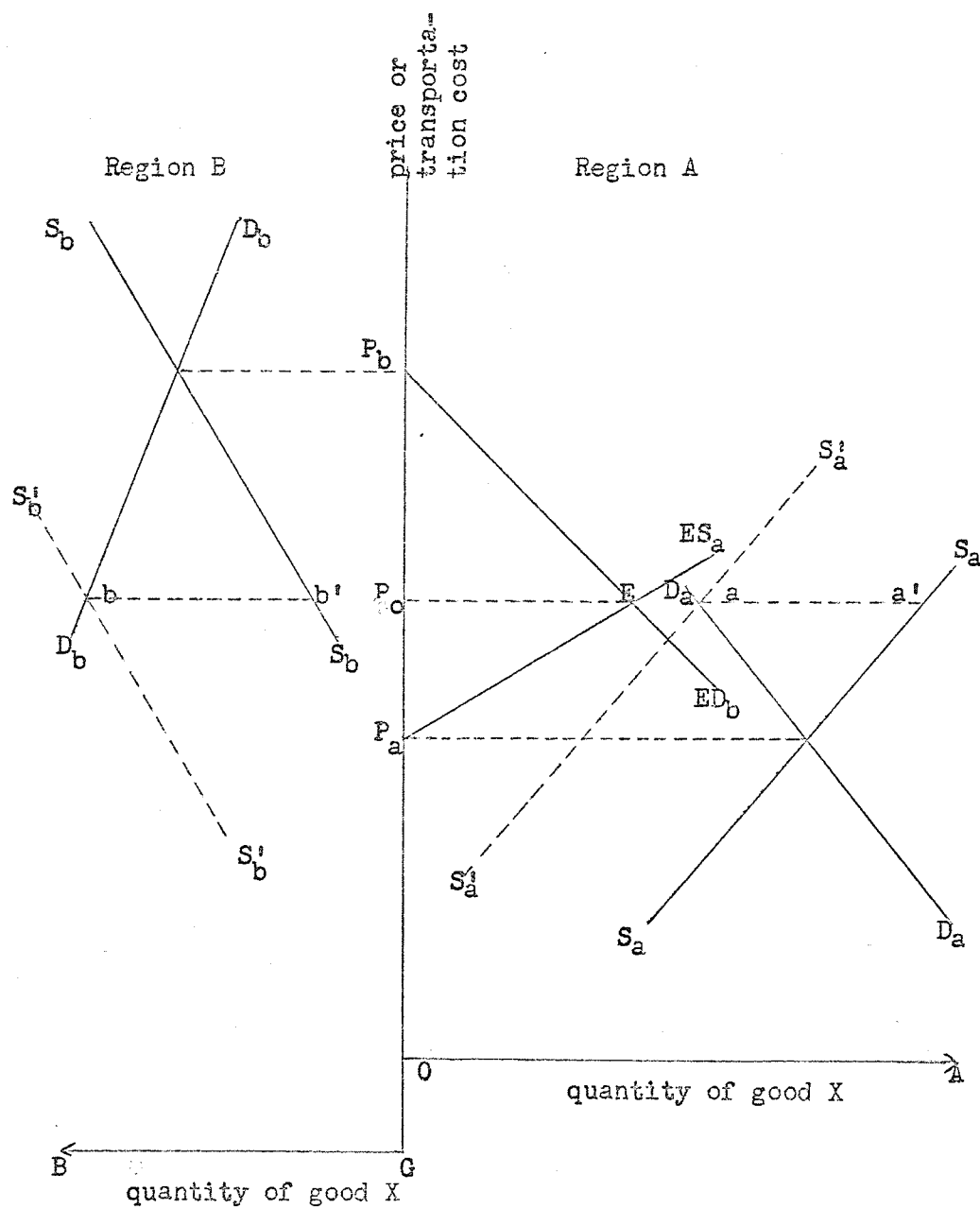


FIGURE 3

INTERREGIONAL EQUILIBRIA IN PRICES AND QUANTITIES

the sum of algebraic areas under the ED function and under the ES function which are opposite in algebraic sign.²⁵ Mathematically, expressing the ED function by $f(ED)$ and the ES function by $f(ES)$, the gross social payoff would be:

$$\begin{aligned} \text{GSP} &= \int_{P_0}^E f(ED) dx - \int_{P_0}^E f(ES) dx \\ &= P_0 E P_b - (- P_0 E P_a) \\ &= P_b E P_a \end{aligned}$$

In the Figure, the area under the ED function, down to the equilibrium price line P_0E , equals the triangle P_0EP_b ; the area under the ES function (actually, social payoff is indicated by the area above the ES function, up to the equilibrium price line P_0E) equals the negative value of the triangle P_0EP_a . The gross social payoff would be equal to the triangle P_bEP_a .

(4) In the previous steps, it was assumed that $T_{ab} = 0$. Evidently the transporting cost plays a dominant role in the field of the spatial equilibrium problem. The cost influences the amount of interregional trade, the price differential and the magnitude of the net social payoff (NSP). Samuelson gave the definition of NSP as: $\text{NSP} = \text{GSP} - \text{T.C.}$ ²⁶ He took NSP as a criterion to examine the optimum interregional trade pattern.

²⁵Ibid., p. 288.

²⁶Ibid., p. 290.

Based on Samuelson's idea, Judge and Takayama²⁷ build up a diagram to show how the transfer cost is introduced into the problem. The diagram has been slightly simplified for this study and is shown in Figure 4.

This Figure was developed by raising the horizontal axis of R_b from BG to B'O which is on the same level as the axis of R_a at OA, and raising the ED_b to ED_b' by a vertical distance P_bP_b' , which at the same time equals the transportation cost GO or P_oP_o' . The vertical distance OP_b' corresponds to GP_b which is equivalent to the initial equilibrium price in R_b .

(5) The concept: "NSP will be maximized when the post-trade price differential equals the unit transportation cost" will be interpreted graphically.

Case I: Initial equilibrium situation, no trade takes place.

- (a): price of good X in Region A (P_{R_a}) equals OP_a
- (b): price of good X in Region B (P_{R_b}) equals OP_b'
- (c): price differential between R_a and R_b (PD_{ab}) equals P_aP_b'
- (d): Gross social payoff (GSP) equals zero
- (e): Total transportation cost (TTC) equals zero
- (f): Unit transportation cost (UTC) equals P_oP_o'
- (g): Net social payoff (NSP) equals zero

²⁷

T. Takayama and G. G. Judge, "Spatial Equilibrium and Quadratic Programming," Journal of Farm Economics (Vol. 46, No. 1, Feb. 1964), pp. 67-93.

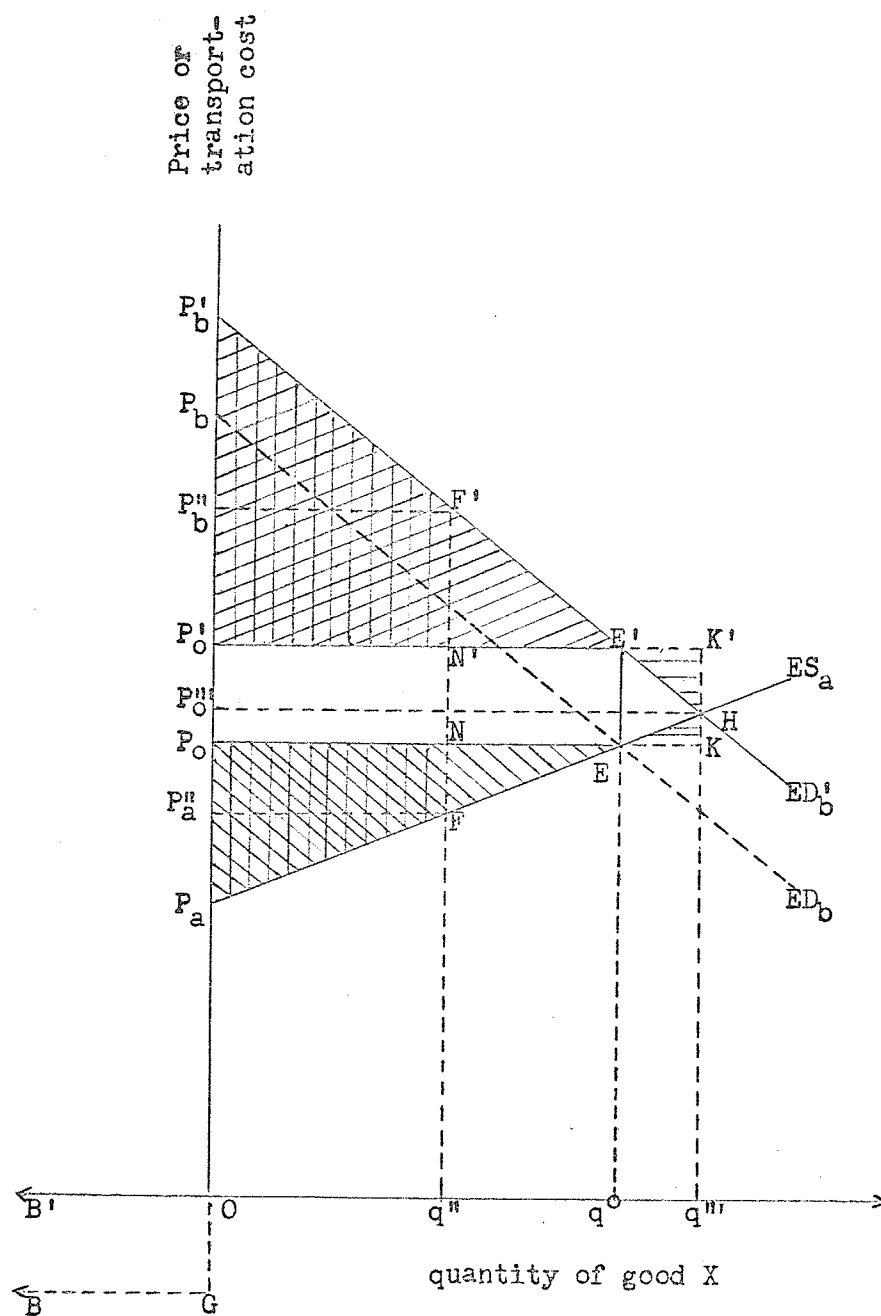


FIGURE 4

MAXIMIZATION: THE NET SOCIAL PAY-OFF

Case II: If Oq'' units of good X are shipped from R_a to R_b

- (a): $P_{R_a} = OP_a''$
- (b): $P_{R_b} = OP_b''$
- (c): $PD_{ab} = P_a''P_b'' > P_oP_o' = UTC$
- (d): $GSP = P_a''FF'P_b'$
- (e): $TTC = UTC \cdot Oq'' = P_oP_o' \cdot Oq'' = P_oNN'P_o'$
- (f): $NSP = P_a''FNP_o + P_o'N'F'P_b' = \text{the areas shaded by the vertical lines.}$

Case III: If Oq^o units of good X are shipped from R_a to R_b

- (a): $P_{R_a} = OP_o$
- (b): $P_{R_b} = OP_o'$
- (c): $PD_{ab} = P_oP_o' = UTC$
- (d): $GSP = P_aEE'P_b'$
- (e): $TTC = P_oP_o' \cdot Oq^o = P_oEE'P_o'$
- (g): $NSP = P_aEP_o + P_o'E'P_b' = \text{max.} = \text{the areas shaded by the oblique lines.}$

Case IV: If Oq''' units of good X are shipped from R_a to R_b

- (a,b): $P_{R_a} = P_{R_b} = OP_o'''$
- (c): $PD_{ab} = 0 < UTC$
- (d): $GSP = P_aHP_o''' + P_o'''HP_b'$
- (e): $TTC = P_oKK'P_o'$
- (g): $NSP = P_aEP_o + P_o'E'P_b' - (EKH + HK'E')$
 $= \text{the areas shaded by the oblique lines minus}$
 $\text{the areas shaded by the horizontal lines.}$

It is evident that when the NSP is maximized, in Case III, the price differential just equals the unit transportation cost.

The second basic concept of Samuelson's model is that when the total transportation cost of all shipments is minimized, then the NSP will be maximized. The problem is how to minimize total transportation costs. The transportation model of the linear programming form provides a suitable procedure to follow in solving this problem.²⁸ The discussion of this part, which is beyond the scope of this study, will be omitted.

III. THE APPLICATION OF SPATIAL EQUILIBRIUM THEORY

Hog Wholesale Price Differential Between Toronto and Winnipeg

From the economic and technical standpoint, after innovation of the refrigerator car large volumes of meat shipment become possible.²⁹ During the time period of this study, the private meat trade in Manitoba and Ontario faced no legal restrictions with respect to the marketing of hogs or pork. It was estimated earlier that on the average from 1957 to 1966, 61 per cent of the hogs slaughtered in Manitoba moved eastward in carcass form.³⁰ Among them, a substantial proportion was presumably exported to Ontario.

²⁸L. O. Heady and W. Candler, Linear Programming Methods (Ames: The Iowa State University Press, 1958), Chapter 10.

²⁹Faculty of Agriculture and Home Economics, University of Manitoba, Principles and Practices of Commercial Farming, Winnipeg, 1961, p. 390.

³⁰See Table II in Chapter II.

Based on Samuelson's spatial equilibrium model, the pork wholesale price differential between Toronto and Winnipeg should be equal to the meat transportation cost between these two markets. Under the assumption that the price levels and transportation costs were constant and using W_T to represent the wholesale price level in Toronto and W_W to represent the wholesale price level in Winnipeg, we can express these two price level lines diagrammatically as being horizontal and parallel with each other (see Figure 5). The vertical distances, OW_T and OW_W , indicate the average wholesale price level in each market respectively. The vertical distance between these two lines is $W_T - W_W$ which equals the unit meat transportation cost.

Relationship Between Wholesale Price and Farm Price

In this study, it is desired to analyze the hog price differentials, at the farm level, between Toronto and Winnipeg. Even though there were no legal restrictions on inter-market trade, it would not be economical to ship hogs in the live form. During the last decade, only a negligible number of live hogs have been shipped between the two markets. For example, in 1966, only 447 head of hogs were exported from Manitoba to Ontario, and 301 head were exported from Ontario to Manitoba. Theoretically, the live hog price differential should equal the unit livestock transportation cost. Actually, only a small proportion of shipments were in the form of live hogs. If the area hog price patterns were uniform within the Province, then the provincial average price differential could be indicated accurately by the price spread which was estimated from a small proportion of shipments. In the real situation,

the farther the farm distance from the slaughter plant, the lower the hog price would be. The average live hog price differential over the entire Province is not necessarily equal to the average livestock transportation cost of a small proportion within the Province. It is not appropriate to use the freight rates for live animals as an indicator of the equilibrium live hog price differential between these two markets. Therefore, it is inappropriate to apply Samuelson's model directly in this study. The model must be modified.

Typically each marketing firm adds various utilities, such as time, place, form, or possession utilities, to the farm products. The total marketing margin between the farm and the consumer is the aggregation of marketing margins of the various firms in between. The demand for the farm product can be derived from the consumer or intermediary demand functions.³¹

Meat packing companies in Canada perform two major marketing functions: (1) processing of live animals and (2) wholesale distribution of carcasses.³² The price margin between the packer and the farmer is equal to the wholesaling margin including the processing cost and the packer's profit. In other words, $\text{wholesale price} = \text{farm price} + \text{wholesaling margin}$, or $\text{farm price} = \text{wholesale price} - \text{wholesaling margin}$.

³¹V. L. Sorenson, Agricultural Market Analysis (Michigan State University, 1964), pp. 230-4 and F. L. Thomsen and R. T. Foote, Agricultural Price (2nd ed., McGraw Hill Book Co. Inc., 1952), pp. 51-5.

³²A. W. Wood, Marketing Margins for Beef in Manitoba 1935-1957 (University of Manitoba, Winnipeg, Manitoba, 1959), p. 12.

The Modification of Samuelson's Spatial Equilibrium Model

Samuelson's model states that the price differential for a homogeneous commodity is equal to the unit transportation cost between two regions. Suppose there exist two different marketing systems for the same commodity in two markets. If we take the effect of the marketing system on prices into consideration, then the spatial equilibrium model should be modified so that the price differential equals the sum of the transportation cost plus the effect of the marketing system.

Algebraically expressed, the price differentials could be written as follows:

Toronto pork price = Winnipeg pork price + meat transportation cost

or

Toronto live hog price + wholesaling marketing margin = Winnipeg live hog price + wholesaling marketing margin + meat transportation cost.

If the wholesaling marketing margins in the two markets are the same, the Toronto live hog price equals the sum of Winnipeg live hog price and the meat transportation cost. The actual margins in the two markets are, however, not necessarily the same.

On the basis of this argument, an analysis was made of the hog price differentials between Toronto and Winnipeg previous to and subsequent to the setting up of the teletype selling systems in the two markets. This was done under the assumptions that (1) the Toronto and Winnipeg markets are interconnected--there is not any legal restriction on interregional trade; (2) in order to avoid extra shrinkage and bruising, shipments are made in the form of hog carcass rather than live hogs and

the inter-market movement of product is initiated by the packers; (3) since the nationally-organized packing companies own the slaughter plants in each area and they presumably adopt the same processing technique in all regions, the processing costs in both markets are the same; and (4) the transportation cost is known and given.

This study involves the time period from December 1958 to June 1968. The time series of hog price spreads between Toronto and Winnipeg have been divided into three periods, i.e., Period I (before teletype), Period II (beginning when Toronto set up teletype) and Period III (beginning when teletype was established in Winnipeg).

In Figure 5 the lines $W_T W_T'$ and $W_W W_W'$ represent the hypothetical average wholesale carcass prices, received by the packers in Toronto and Winnipeg, respectively. The lines $F_T F_T'$ and $F_W F_W'$ represent the hypothetical average farm prices, on a carcass basis, which are received by the farmers or are paid by the packers in the two markets. These two lines are derived from the wholesale price lines, $W_T W_T'$ and $W_W W_W'$, by subtracting the wholesaling margins.

In Period I, the wholesale carcass price differential between Toronto and Winnipeg is $OW_T - OW_W$, or equals the vertical distance $W_T W_W$. The amount is equal to the unit meat transportation cost. As indicated earlier, a large portion (61 per cent) of the Winnipeg hogs are shipped eastward in the form of carcass meat. If the price spread is greater than the unit transportation cost, profit-seeking traders would ship more meat from Winnipeg to Toronto. On the other hand, if the price spread is less than the transportation cost, it would discourage the traders.

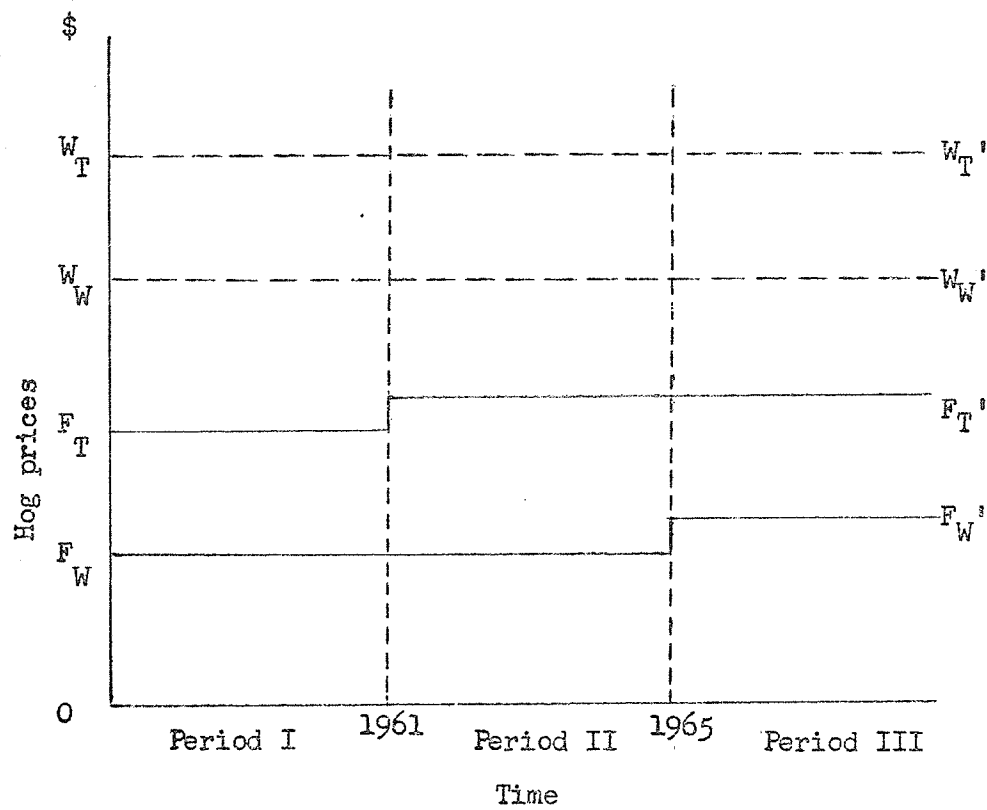


FIGURE 5

HYPOTHETICAL HOG PRICE DIFFERENTIALS
BETWEEN TORONTO AND WINNIPEG

from moving meat. The amount of shipments would be adjusted depending upon the transportation cost and the demand-supply conditions. Finally, they are balanced at a particular price when the price differential, $W_T W_W$, equals the unit transportation cost.

During the first period, the hogs were sold by private treaty in both markets. Under the assumption that the processing costs were the same, the packer's profits would be expected to be the same. Consequently, the wholesaling margin (MM) or the sum of the packer's profits and the processing costs would be the same. In the Figure, the vertical distances of $W_T F_T$ and $W_W F_W$ should be identified. Knowing $OW_T - OW_W = T.C.$ and $MM_T = MM_W$, we can obtain the result of $OF_T - OF_W = T.C.$, since $OW_T - OW_W = (OW_T - MM_T) - (OW_W - MM_W) + (MM_T - MM_W) = OF_T - OF_W + 0 = T.C.$ In other words, the hog price differential between the two markets at the farm level is equal to the meat transportation cost.

In Period II, when teletype was introduced in the Toronto market, it is expected that wholesale price would remain at the same levels since those prices are determined by interaction of supply and demand forces at the level of sale to the retail trade. The inter-market wholesale price spread would continue equal to the cost of transportation. Assuming that teletype selling made conditions more competitive in the Toronto market, the packers would be forced to bid more aggressively for hogs and thereby to pay higher prices to the producers. Since this increased competition would not change the state of competition among retailers, the packer selling prices would not be affected. The packers would receive the same prices from the retailers as they did in Period I.

Packer profits would be reduced unless they improved their processing techniques and reduced their processing costs. The marketing margin in Toronto would be less than that in Period I.

During the same period, in Manitoba, the hog marketing method did not change, the marketing margin might be expected to remain at the same level. Therefore, the marketing margin in Toronto would be less than that in Winnipeg, i.e., $MM_T < MM_W$. If $OW_T - OW_W = T.C.$ and $MM_T < MM_W$, then $(OF_T - OF_W) > T.C.$

Since $OW_T - OW_W = (OW_T - MM_T) - (OW_W - MM_W) + (MM_T - MM_W)$

$$= OF_T - OF_W + (-\Delta) = T.C. \text{ or}$$

$$= OF_T - OF_W = T.C. + \Delta.$$

The size of Δ would indicate the quantitative effect of the Toronto teletype system on hog prices.

The inauguration of the teletype auction method might be expected to result in a decrease in the packer's profit and an increase in the farm price. If these conditions actually held, the live hog price spread between these two markets would be greater than the meat transportation cost. This outcome conflicts with the Samuelson model, since the price effect in Toronto is not transmitted to Winnipeg (i.e., a rise in F_W until $OF_T - OF_W = T.C.$).

The live hog price differential during this period was in fact greater than the meat transportation cost. The Winnipeg packers had two alternatives. First, they could choose not to ship additional pork to Toronto. In this case they would continue to receive the same amount of marketing margin, $W_W F_W$, (see Figure 5) as they did in Period I. Alter-

natively, they might ship more meat to Toronto. They might have the greater gross marketing margin $W_T F_W$. At the same time, they would have to pay transportation cost for the extra shipments. They would then have the net marketing margin $W_W F_W$: $W_T F_W - W_T W_W = W_W F_W$ when $W_T W_W = T.C.$ They would receive no more than they would under the first alternative. There would be nothing to encourage the Winnipeg packers to ship more meat to Toronto unless the price spread was greater than the sum of transportation cost plus the effect of the teletype system on hog prices.

On the other hand, if Toronto retailers went to Winnipeg to buy meat, they would have to pay the wholesale carcass price, OW_W , to Winnipeg packers and to pay T.C., $W_T W_W$. The total payment would be OW_T . They would make no profit on the transaction. There would be no inducement for anyone to undertake extra inter-market shipment to gain from arbitrage.

In short, the Toronto packers were compelled to accept a reduction in profit levels as a result of the establishment of the new selling system. In this particular case, the Toronto-Winnipeg hog price differential equalled the sum of the meat T.C. plus the effect of the teletype selling system on hog prices. This measure is derived from but does not conflict with Samuelson's model.

In Period III, the teletype selling mechanism was operating in both Toronto and Winnipeg. The Winnipeg packers were also forced by the introduction of competitive bidding to pay a higher price to the producers. The effect of the teletype system on hog prices in Toronto

was then paralleled in Winnipeg. The Samuelson model again applies.

The price differential just equals the transportation cost.

CHAPTER IV

EMPIRICAL ANALYSIS

The Magnitude of Price Differentials between Toronto and Winnipeg

The average price spread between Toronto and Winnipeg for Period I, based on the Samuelson spatial equilibrium model, is expected to be equal to transportation cost (T.C.). In Period II, based on the modified spatial equilibrium model, the price spread is expected to be greater than T.C. In Period III, if there is no significant difference between the effects of the teletype system in the two markets, then the price spread is expected to be equal to T.C. These hypotheses will be tested by the technique of statistical inference.

For this purpose, the null hypothesis will be set up that the price differential equals the transportation cost in each period. In Periods I and III, the alternative hypotheses would be that the price differentials were not equal to the T.C. In Period II, according to the modified spatial equilibrium model, it is expected that if the price spread was not equal to the value postulated under the null hypothesis, then its value would be larger than the postulated value. The alternative hypothesis would be that the price spread is greater than the transportation cost.

In testing the hypotheses that the mean differences have a certain value, the following theory will be employed: if \bar{X}_1 and \bar{X}_2 are the mean of two large independent random samples of size n_1 and n_2 , the sampling distribution of the statistic $\bar{X}_1 - \bar{X}_2$ can be approximated closely with

a normal curve having the mean difference $\mu_1 - \mu_2$ and the standard deviation $\sqrt{\sigma_1^2/n_1 + \sigma_2^2/n_2}$, where μ_1 and μ_2 are the means of the corresponding populations from which the two samples were obtained and σ_1^2 and σ_2^2 are their respective variances.¹

Tests concerning mean differences are based on the statistic Z , value of which is defined as follows:

$$Z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\sigma_1^2/n_1 + \sigma_2^2/n_2}}$$

The method for testing the hypothesis can be expressed in terms of the critical region. If the calculated Z value is greater than the confidence limits for falling in the critical region, the hypothesis will be rejected; otherwise the hypothesis will be accepted.² A critical region for which the significant value of α equals 5 per cent has been chosen for this study. The value of $\alpha = 5$ per cent is quite arbitrary here and some other value might have been selected. However, this is the value of α most commonly used by applied statisticians.³

In Period I, Toronto and Winnipeg weekly average hog prices were \$25.34 and \$23.17 per hundredweight respectively (see Table III) and the price spread was \$2.17. The average rail freight rates on fresh pork cuts from Winnipeg to Toronto, minimum 30,000 pounds carload, was \$2.18

¹J. E. Freund, Modern Elementary Statistics (3rd ed., New Jersey: Prentice-Hall, Inc., 1967), p. 254.

²Ibid., p. 255.

³R. G. Hoel, Elementary Statistics (New York: John Wiley and Sons, Inc. 1962), p. 105.

per hundredweight. The net price spread, price spread minus transportation cost, was negative one cent per hundredweight. The one cent difference was equivalent to -0.034 in a standard normal distribution table. The absolute value was less than the critical Z value, 1.96, at the level of significance = 5 per cent. It fell within the confidence interval.⁴ The difference between the expected net price spread of zero and the actual net price spread of negative one cent, was so small that it could well be attributed to chance. It is safe to say that the difference was not statistically significant and to accept the null hypothesis.

In Period II, the weekly average net price spread was fifty cents per hundredweight. Substituting this figure into the formula of the Z statistic, the estimated Z value was 2.569. This value is greater than the critical Z value, or the confidence limit, 1.64. Statistically speaking, the difference between the expected and the actual value was so large that it could not reasonably be attributed to chance. The net spread of fifty cents was significantly different from zero. The null hypothesis is therefore rejected. This is equivalent to the acceptance of the alternative hypothesis that the price spread is greater than the transportation cost. Accepting the alternative hypothesis implies that the teletype system in Toronto has a significant positive effect on the hog price level.

In Period III, the weekly average net price spread was negative

⁴Ibid., p. 138.

three cents per hundredweight. This difference was so small it could easily have occurred by chance and therefore the null hypothesis is accepted. It implies that there is no significant difference between the effects of the teletype system in the two markets. The significant effect of the teletype system in Toronto has been demonstrated for Period II. Similarly, the results of the analysis of prices in Period III indicate that the teletype system in Winnipeg also has a significant effect on hog prices.

The monthly average hog prices have been used to check the precision of the estimation. Table III shows that, during the same periods, the monthly average prices nearly coincided with the weekly average prices. Based on these two sets of data, the same expected results have been detected.

The Frequency Distribution of the Net Price Spreads Between Toronto and Winnipeg

In the above calculations the average prices, or the mean of the price for each period was used to estimate the effect of the teletype system. The use of the mean has the disadvantage that if most of the prices are fairly low, but there is a small percentage of very high prices, the mean may not be a good indicator of the price level. The median is sometimes better than the mean as an indicator of what is popularly meant by the price level. The median of a set of measurements is defined as the middle measurement. The median has the desirable property that the probability of a sample value exceeding the population median

TABLE III

HOG PRICE SPREADS BETWEEN TORONTO AND WINNIPEG
DURING DECEMBER 1958 TO JUNE 1968^a

Period	Time	Toronto average prices	Winnipeg average prices	Price spreads	Rail freight rates	Net price spreads	Estim. Z values	Normal test results ^b
I	Dec. 1958 to April 1961	(months) \$25.37	\$23.17	\$ 2.20	\$ 2.18	2¢	0.033	N.S.
	Dec. 1, 1958 to May 6, 1961	(weeks) 25.34	23.17	2.17	2.18	-1	-0.034	N.S.
II	May 1961 to Feb. 1965	(months) 28.26	25.84	2.42	1.91	51	1.673	*
	May 8, 1961 to Feb. 27, 1965	(weeks) 28.29	25.88	2.41	1.91	50	2.569	*
III	March 1965 to May 1968	(months) 33.06	31.21	1.86	1.90	4	-0.041	N.S.
	March 1, 1965 to June 8, 1968	(weeks) 33.02	31.15	1.87	1.90	-3	-0.064	N.S.

^a For sources see Tables XIII to XVIII.

^b In Periods I and III, using two-tail test, $\alpha = 5$ per cent, critical Z value = 1.96;

In Period II, using one-tail test, $\alpha = 5$ per cent, critical Z value = 1.64.

* Significant difference.

is one half. As a result, it is possible to design methods for testing hypothetical numbers of the net price spreads by the Sign-test.⁵

As stated earlier, the price spread should be equal to the transportation cost or the net price spread should equal zero. Actually, among 612 pairs of observations in this study, for only one pair was the price spread and the transportation cost exactly equal (see Table XV). There exists a stochastic disturbance (or error) term in each pair. According to Professor Johnston,⁶ there are three possible ways for errors to occur. These are: (1) many of the factors which affect the magnitude of the price spread will not be quantifiable, and even if they are, it is not usually possible in practice to obtain data on them all; (2) there is a basic and unpredictable element of randomness in human responses which can be adequately characterized only by the inclusion of a random variable term; and (3) a third source of error lies in errors of observation or measurement.

It is generally assumed that error terms are subject to a normal distribution, a symmetrical distribution, with a zero mean and a constant variance.⁷ Similarly, the distribution of the errors which are associated with the net price spreads, is expected to be a symmetrical distribution. The distribution of the error would be centered around the

⁵Ibid., p. 171.

⁶J. Johnston, Econometric Methods, McGraw-Hill Book Co., Inc., New York, 1963, pp. 5-8.

⁷Ibid., p. 9.

expected net price spread. As a consequence, the number of the positive NPS and that of negative NPS are expected to be equal. To test the equality of the number of positive and negative NPS values the technique of the Sign-test will be employed and the Z statistic will be used as the criterion.

The Z statistic used in this study is:

$$Z = \frac{x - np}{\sqrt{npq}}$$

in which the variable x represents the number of the positive NPS, and the total number of the observations in each period is denoted by n. The symbols p and q represent the probability of a positive and negative NPS respectively. They will be obtained when an observation is taken. The hypothetical frequency of the positive NPS in each period is denoted by np. The value of \sqrt{npq} represents the standard deviation of the frequency distribution.⁸

To deal with the specific problem of testing the theoretical hypothesis that the number of positive NPS and that of negative NPS are equal, the null hypothesis will be set up as that $p = 1/2$ or $np = n/2$ (the number of positive NPS is one half of the total observations). Depending on the different situations, the alternative hypothesis may be $p \neq 1/2$ or $p > 1/2$.

In Period I, before teletype, the private treaty method of selling hogs was used both in Ontario and Manitoba. Since it is assumed that

⁸Hoel, op. cit., p. 172.

there was no difference in the selling method, the price spread between Toronto and Winnipeg should be equal to the transportation cost between the two markets. Consequently, the frequency distribution of the NPS would be symmetrical. It is suitable to use the two-tail test. The alternative hypothesis will be $p \neq 1/2$ or $np \neq np/2$. (The number of positive NPS may be greater than or less than one half of the total observations.)

In Period II, when Toronto priced by teletype, if the system has a significant effect on hog price level, then in most cases the price spread would be greater than the transportation cost. The frequency distribution of the NPS would be skewed toward the positive NPS. If the imbalance in the frequency were great enough, it would support the belief that the selling mechanism affects the price. In this case, it is suitable to use the left tail test. The alternative hypothesis will be $p > 1/2$ or $np > n/2$ (the number of positive NPS is greater than a half of the total observations).

In Period III, the teletype mechanism also operated in Winnipeg. If the system in Winnipeg also has a significant effect on prices and there is no difference between the effects of the compulsory teletype and the voluntary teletype, then the price spread would again be equal to the transportation cost. The frequency of the positive NPS and the negative NPS would be in balance. In this case, the hypothesis will be $p = 1/2$ or $np = n/2$.

According to the monthly and weekly data, the theoretical hypotheses of $p = 1/2$ are accepted both in Period I and III and it is re-

jected in Period II. Acceptance of the null hypothesis, in a statistical sense, implies that the numbers of the positive NPS and the negative NPS are the same. Conversely, rejecting the null hypothesis or accepting the alternative hypothesis implies that the number of the positive NPS is greater than that of the negative NPS. From the evidence, it is concluded that the teletype selling system both in Toronto and Winnipeg has a significant effect on hog prices.

The Net Benefit to Hog Producers

In the previous calculation, after the teletype system was established in Ontario, the weekly average price spread between Toronto and Winnipeg was higher than the average freight rate for meat by approximately fifty cents per hundredweight. It was concluded that the teletype system in Ontario had a significant effect on hog prices. It apparently increased the price received by hog producers from the sale of hogs by fifty cents per hundredweight. After the teletype auction was established in Manitoba, there was no significant difference between the freight rate and the price spread between Toronto and Winnipeg. This indicated that the price spread had been reduced as a result of an increase in the hog price in Manitoba equal to fifty cents per hundredweight.

Prior to the first establishment of the Ontario Hog Marketing Board, there was no compulsory service charge on Ontario hogs. When there were no regulations to direct hogs through a particular marketing channel, approximately ninety per cent of the Ontario-raised hogs were sold to packing plants through other than public market channels.

TABLE IV

THE FREQUENCY DISTRIBUTION OF MONTHLY AND WEEKLY NET PRICE SPREADS
BETWEEN TORONTO AND WINNIPEG DURING DECEMBER 1958 TO JUNE 1968^a

Period	Time	No. of obser- vations	No. of positive NPS	No. of negative NPS	Estimated Z values ^b
I	Dec. 1958 to April 1961	29	17	12	0.929 N.S.
	Dec. 1, 1958 to May 6, 1961	128	68	60	0.707 N.S.
II	May 1961 to Feb. 1965	46	39	7	4.720*
	May 8, 1961 to Feb. 27, 1965	199	159	40	8.440*
III	March 1965 to May 1968	39 ^c	19	19	-0.160 N.S.
	March 1, 1965 to June 8, 1968	171	80	91	-0.841 N.S.

^aFor sources see Tables XIII to XVIII.

^bIn Periods I and III, using two-tail test, $\alpha = 5$ per cent, critical Z value = 1.96;
In Period II, using one-tail test, $\alpha = 5$ per cent, critical Z value = 1.64.

^cIn one month the price spread and the transportation cost were equal.

*Significant difference.

Marketing charges of an unknown amount were involved for an indeterminate proportion of such hogs. The other 10 per cent were sold through the commission firms located at the public stockyards. If the hogs were sold by the commission firms, hog producers had to pay yardage of fifteen cents per head and a selling commission of forty cents per head.⁹

The sum of these two charges was approximately fifty-five cents per head. This is equivalent to approximately 5.5 cents per head, on the average, for the total hog marketings in the Province. Since 1958, the Ontario Hog Marketing Board has levied forty cents per head for all hogs marketed. Subtracting the original average of charges from the Board's service charge, the farmers have paid an additional 34.5 cents per head. This is a maximum estimate since marketing charges for 90 per cent of the hogs are not known.

Similarly, in Manitoba, in 1964 (before teletype), approximately 10 per cent of the commercial market hogs were sold through the commission firms located at the public stockyards. Those farmers had to pay yardage of fifteen cents and a commission fee of thirty cents per head.¹⁰ The sum of these two charges was approximately forty-five cents per head. This is equivalent to 4.5 cents per head, on the average, for the total hog marketings in Manitoba. Since teletype was introduced, the Manitoba Commission has levied thirty cents per head for all hogs marketed.

⁹Livestock Marketing in Manitoba, pp. 265-6.

¹⁰The commission rate per head for hogs delivered by truck, the transportation method most commonly used. Rates were slightly lower on full carload lots delivered by rail.

Therefore, the farmers have paid an additional 25.5 cents per head. This is also a maximum estimate since costs of direct marketings is not known and is not deducted.

It has been estimated that, since the establishment of the teletype selling system, hog prices have been increased by fifty cents per hundredweight. The Canadian warm dressed weight of each hog averaged 161 pounds in 1966. Under the assumption that the Ontario and the Manitoba dressed weights were the same as the national average, the increased price, on the average, was approximately eighty-one cents per head. The estimated net increments in the hog price were 46.5 (81 cents - 34.5 cents) and 55.5 (81 cents - 25.5 cents) per head in Ontario and Manitoba respectively.

In 1966, the total number of hogs marketed by Ontario and Manitoba producers were 2,597,478 head and 593,270 head respectively. The total increased net returns to hog producers would be approximately \$1,200,000 and \$330,000 for the year in Ontario and in Manitoba. During the same year, it should be noted, 114,334 Saskatchewan hogs were marketed in Manitoba at prices established by the teletype system but without contributing any levy for the operations of that system. The gain to the producers of these hogs could be estimated at eighty-one cents per head or a total of \$92,610. To the extent that prices may have been

enhanced in other nearby markets, the total producer gain would be somewhat greater than the total amounts estimated.¹¹

¹¹Before teletype, approximately 10 per cent of the commercial market hogs in Manitoba were sold through the public stockyards. The remainder was sold to packer buying stations, to independent livestock dealers, through the Co-operative Livestock Auction Market at Brandon, or delivered direct to the packing plants. All these were classified as "direct sale." Direct to plant does not mean direct from farm to plant. In many cases, hog producers had to pay some charges equivalent to the commission fee. No figures are available to indicate such charges. However, it is obvious that prior to the introduction of the teletype system in Manitoba, the average yardage and commission fee for the total hog marketings in the Province should be more than 4.5 cents per head. In essence, after teletype, the additional payment was less than 25.5 cents per head. On the other hand, the costs of additional marketing service such as providing the market information to farmers were paid out of the general levy. Therefore, the actual gain by hog producers due to the introduction of teletype system would be greater than those estimated here.

CHAPTER V

A CRITIQUE OF LOWE'S "AN ECONOMIC ANALYSIS OF THE TELETYPE HOG MARKETING SYSTEM IN MANITOBA CANADA"

I. A BRIEF REVIEW OF LOWE'S THESIS¹

Upon completion of the first draft of this thesis, it was learned that a similar analysis has recently been completed by Mr. J. C. Lowe, a graduate student at the University of Wisconsin. First, Lowe described the production, consumption, movement, and marketing of hogs in Manitoba and the conduct and performance of the market prior to the foundation of the Manitoba Hog Marketing Commission. Then he described the establishment of the teletype system and the details of its operation. Next, he made an evaluation of the effect of the teletype system on pricing efficiency of the market. In undertaking that task, he used the linear single-equation approach. Before summarizing his results, he discussed the evaluation of the operational efficiency of the market from the standpoints of cost, speed, convenience and equitability.

II. CRITICISM OF SOME TECHNIQUES USED IN LOWE'S THESIS

The Suitability of a Single-Equation Approach²

Lowe hypothesized that (1) the establishment of the teletype

¹J. C. Lowe, "An Economic Analysis of the Teletype Hog Marketing System in Manitoba Canada" (Unpublished Master's thesis, University of Wisconsin, Wisconsin, 1968).

²The discussion of the suitability of a single-equation approach

system in Manitoba would result in decreasing the price difference between Toronto and Winnipeg; (2) competition had increased in the Winnipeg hog market due to the new system and competition resulted in an increased responsiveness of Winnipeg price to supply changes and Toronto price changes. The author tested these hypotheses by using dummy variables in a linear single-equation model. The model used is as follows:³

$$\text{period one}^4: P = a_0 + b_0X + c_0Y$$

$$\text{period two}^4: P = (a_0 + a_1) + (b_0 + b_1)X + (c_0 + c_1)Y$$

where P = difference in average weekly price between Toronto and Winnipeg for a grade B carcass

X = relative supply represented by ratio of weekly hogs slaughtered in Manitoba to that in Ontario

Y = dressed grade B hog prices in Toronto

The author expected to find the regression coefficients for the dummy variables a_1 , b_1 , and c_1 to be significantly different from zero. If the expected results were satisfied, then it would indicate that the changes in the intercept and the slope from period one to period two are significant. As a consequence, the hypotheses would be accepted.

presented in this paragraph is drawn primarily from R. J. Foote, Analytical Tools for Studying Demand and Price Structures (Agriculture Handbook No. 146, USDA), J. Johnston, Econometric Methods (New York: McGraw-Hill Book Co., 1963), and L. R. Klein, A Textbook of Econometrics (New York: Harper & Row, 1953).

³Lowe, op. cit., pp. 77-87.

⁴Periods one and two in Lowe's thesis were equivalent to Periods II and III in this study.

The suitability of using the linear single-equation model to deal with the specific problem of the effect of the teletype system on hog prices may be questioned. Foote observed that before 1950, nearly all equations used in price analysis were fitted by the method of least-squares. However, the linear single-equation approach is subject to several econometric limitations such as the problems of autocorrelation (serial correlation between successive values), multicollinearity (some or all of explanatory variables in a relation are highly correlated one with another), heteroscedasticity (conflicting with the assumption of a constant variance in the linear regression model) and the identification problem. Staff members of the Cowles Commission for research in Economics spent about ten years (1943-53) in studying these econometric problems. They concluded that in order to understand and to quantify economic relationships, entire systems of equations had to be considered as a unit. The single equation approach was completely outmoded.⁵

Johnston also pointed out that

. . . the most serious defect of the single-equation model is that attention is focused on a single equation, when the essence of economic theory is the interdependence of economic phenomena and the determination of values of economic variables by the simultaneous interaction of relationships.⁶

Lowe used the single equation technique with weekly data to analyze the specific problem of price difference. A high autocorrelation may have existed among the series of weekly price differences.⁷

⁵Foote, op. cit., p. 53.

⁶Johnston, op. cit., p. 146.

⁷According to Klein, "if we try to enlarge the sample size by

But the author took no account of this problem.

In Lowe's model, price difference is a function of the relative supply and Toronto price. Actually, the one-way relation from independent variables to dependent variable does not hold. As the author himself stated, "in a perfect market prices in different areas will differ only by the costs of transfer of the product."⁸ The supply of meat in the markets would be affected by the Toronto-Winnipeg price difference. If price difference is high enough, the profit seeker would ship more meat from Winnipeg to Toronto. As a consequence, the relative supply between Winnipeg and Toronto would be affected.

If the price difference and the relative supply are intercorrelated, it is inappropriate to apply the single-equation approach directly. Klein claimed that, "the single-equation approach is suitable for solving for the endogenous variable in terms of predetermined (i.e., exogenous and lagged endogenous) variables alone."⁹ When the independent variable (relative supply) and the dependent variable (price difference) are intercorrelated, according to Johnston, the direct application of

taking more frequent observations, says by quarters, months, or weeks, we encounter the problem of serial correlation." Source: Klein, op. cit., p. 267.

The autocorrelation of the price difference between Toronto and Winnipeg during the eighty-five month period, from May 1961 to May 1968, has been tested. The Durbin-Watson variable was 0.922 which is less than the lower limit of the significance point 1.60 (in the case of one explanatory variable). It is concluded that autocorrelation existed.

⁸Lowe, op. cit., p. 62.

⁹Klein, op. cit., p. 246.

An endogenous variable is determined by the simultaneous interaction of the relations in a structural model; an exogenous variable is determined outside the model.

least squares to a single equation will not yield unbiased and consistent estimates of the regression coefficients.¹⁰

Ignoring the above mentioned econometric considerations, it seems hard to give a satisfactory explanation for the estimated regression coefficients in Lowe's model. The estimated equation¹¹ was:

$$P = -2.76 + 1.64D_0 + 7.78X + 8.41S_0 + 0.12Y - 0.17S_1$$

$$(t \text{ ratio}) \quad (1.1^{N.S.}) \quad (7.9^*) \quad (3.5^*) \quad (3.5^*) \quad (-4.1^*)$$

$$R^2 = 0.376$$

In period one: $D_0 = S_0 = S_1 = 0$

In period two: $D_0 = 1$; $S_0 = X$; $S_1 = Y$

The increased intercept of the equation due to the establishment of teletype was indicated by the regression coefficient for dummy variable D_0 . The estimated coefficient was 1.64. However, the figure was not significantly different from zero. The t-ratio was 1.1 which fell within the confidence interval for zero value even at the significance level of 50 per cent. In the statistical sense, the figure of 1.64 was equivalent to zero. From this evidence, the author could hardly draw the conclusion that the price difference had decreased after the introduction of the teletype system.

In Lowe's model, the Toronto price is one of the price difference determining factors. The author also concluded that the negative regres-

¹⁰Johnston, op. cit., pp. 231-5.

¹¹Lowe, op. cit., p. 79.

sion coefficient for S_1 (-0.17) might indicate that the Winnipeg market had become more responsive than the Toronto market to factors determining the Toronto price. Lowe mentioned that before teletype was adopted in Winnipeg, the higher the Toronto price, the higher the price difference between Toronto and Winnipeg. The Toronto price and the price spread are positively correlated. During the teletype period in Winnipeg, by contrast, the higher the Toronto price, the lower the price difference between Toronto and Winnipeg. The Toronto price and the price spread are negatively correlated.¹²

Theoretically, the Winnipeg-Toronto price differential should be a constant, rather than the Winnipeg price being a constant proportion of the Toronto price. What theoretical explanation could there be for the change to the negative relationship between the Toronto price and the price differential? This conflicts with the assumption that the price difference between markets equals the transportation cost.

From the standpoint of the entire equation, the estimated relationships were hardly satisfactory. Substituting the average relative supply, $\bar{X} = 0.25$, and the average Toronto price $\bar{Y} = 31.04$,¹³ in the equation used, the price difference in period one was \$2.91 per hundred-weight and that in period two was \$1.39. The change in the price difference from period one to period two was -\$1.52. On the basis of actual average prices, the calculated change in the differential during that time

¹²Ibid., p. 80.

¹³Ibid., p. 82.

period was -\$0.59.¹⁴ The estimated change of 1.52 is nearly three times as great as the mean actual change. The two values are quite inconsistent.

The Accuracy of the Measurement of Wholesale Pork Prices

Lowe also examined evidence regarding the margins earned by packers previous to and following the adoption of teletype to test the hypothesis that competition in the Winnipeg market had increased. He observed that the ratio of the wholesale bacon price to the hog carcass price increased by 14 per cent from period one to period two in Toronto and that it decreased by 8 per cent in Winnipeg. He concluded that the margins earned by the packers in Manitoba were reduced 22 per cent relative to those in Toronto and on that basis he accepted the hypothesis.

It is probable that the results point in the right direction. However, on the national average data, only 13 per cent of chilled carcass weight is bacon (see Table V) and it is hardly appropriate to estimate the wholesale price by the bacon price alone. The best estimator of the wholesale pork price probably should be the weighted average price of the retail cuts of pork. If the wholesale price change over a given time period are of the same relative magnitude for each of the retail cuts of pork, then the price of any cut would be a good indicator of the general price change. Actually, the price changes differently for each cut. For instance, the weighted wholesale pork average price index in 1966 relative to a 1963 base was 124 per cent. The bacon and ham price

¹⁴Ibid., p. 66.

indexes were 129 per cent and 119 per cent respectively. The bacon price change was 29 per cent and the ham price change was 19 per cent. Neither the bacon price nor the ham price was a very good indicator for the wholesale pork price. One is biased upward and the other is biased downward (see Table V).

TABLE V

AVERAGE WHOLESALE PORK PRICE INDEX
IN WINNIPEG IN 1963 AND 1966*

	Ham	Loin	Shoulder	Bacon	Lard	Other	Average ^a
% of chilled carcass	21%	15.5	15.5	13	17	18	100
1963 price index ^b	100%	100	100	100	100	-	100
1966 price index ^b	119%	119	122	129	135	-	124

*Source: Canada Dept. of Agriculture, Canada Weights Measures and Conversion Factors for Agricultural Products (Ottawa, July 1954), p. 12.

^bDBS #23-203, Livestock and Animal Products Statistics (1963, 1966).

^aThe weighted average took no account of the "other" items including head, kidney, waste, etc.

In addition, to be a valid indicator of profit levels, the ratio of wholesale price to farm price should be based on a constant currency. Otherwise, it is difficult to get an unbiased estimation. For example, in 1963, suppose the wholesale price and farm price were \$50.00 and \$25.00. The wholesaling margin was \$25.00 and the price ratio was 2.00. In 1966, suppose these two prices were \$70.00 and \$45.00. The wholesaling margin still remained \$25.00 but the ratio was 1.56. The fact that the ratio has been reduced from 2.00 to 1.56 is insufficient evidence to prove that the profits earned by packers have been reduced and to accept

the hypothesis that competition in the Winnipeg market has increased.

III. COMPARISON OF THESE TWO THESES

The main differences between Lowe's thesis and the present analysis can be summarized under the following several points.

Difference in Approaches

In Lowe's thesis, it was hypothesized that competition had increased in the Winnipeg market due to the teletype system. The single-equation least squares approach was used to test the hypothesis.

In this thesis, a theoretical basis was developed to evaluate the effect of the teletype system on the price level. It was assumed that the new system had improved the degree of competition among packers. Then a modified spatial equilibrium model was developed to demonstrate the validity of the argument.

Difference in Time Period of Analysis

In Lowe's thesis the analytical period was chosen from 1962 to 1967. The period was divided into two sub-periods, i.e., before and after the teletype system was founded in Manitoba.

In this thesis, the period of 1958 to 1968 was selected. There were three sub-periods, i.e., prior to Ontario teletype, teletype in Ontario only, and teletype in both Provinces.

Difference in Analytical Areas

Lowe examined the Toronto-Winnipeg, and Winnipeg-Edmonton price

differences to test the hypothesis that, after the introduction of teletype, the Winnipeg-Edmonton price difference would be greater than that prior to its introduction. Conversely, during the period with teletype in Winnipeg, the Toronto-Winnipeg price difference would be reduced.

In the present study it was originally planned to analyze the Toronto-Winnipeg and Winnipeg-Saskatoon price spreads prior to and subsequent to the adoption of the teletype selling mechanism to estimate the effect of the new system on hog prices. However, it proved impossible to measure the effect of teletype in the Winnipeg market from changes in the Winnipeg-Saskatoon price spread. Shipments between Winnipeg and Saskatoon are carried out in the form of live hogs rather than in the form of carcasses. The effect of the teletype selling system on hog prices in Manitoba would likely be transmitted to Saskatoon immediately and fully. During the period when teletype operated in Winnipeg, as well as in the period prior to its adoption, the Winnipeg-Saskatoon price spread was equal to the transportation cost for hogs, (see p. 31).

Fortunately, from the different approaches, time periods and analytical areas, the same conclusion that the teletype selling mechanism has a significant effect on hog prices has been reached in these two studies.

CHAPTER VI

SUMMARY AND CONCLUSION

For the purpose of improving the bargaining position of hog producers in the sale of hogs, the teletype auction was instituted in Ontario in 1961 and in Manitoba in 1965. All Ontario-raised hogs must be sold through the Ontario Hog Producers' Co-operative, the selling agent of the Ontario Hog Producers' Marketing Board. The Board was established after a plebiscite among hog producers. The Board was empowered to appoint a market agency and to control marketing. In Manitoba, the voluntary teletype selling system was adopted. Hog producers may sell their animals directly to packing plants by private treaty. Alternatively, they may consign hogs to the Manitoba Hog Marketing Commission and sell their hogs through the teletype auction. The Commission is a creation of the Government of Manitoba.

In the teletype auction, as in the traditional auction, all buyers and sellers are present at a sale. But the auction has been mechanized. When the hogs are ready for sale, the hog selling agency is notified by the assembly yard manager. Then, the agency, located at the central office, sends selling messages such as the offering date and time, the location of the assembly yard, the lot number and the number of hogs in the lot, and the asking price to all buyers simultaneously by the teletype selling unit--an electronic machine.

Seventeen buying machines in Ontario and eight in Manitoba are located at the offices of the various processing plants. One buying

machine, which is available to small packers and brokers, is located in a separate room in the office of both the Board and the Commission. Each buying machine has a message sheet and a buying button. From the message sheet, a buyer receives the selling message transmitted by the selling agency. Since 1940, settlement for all hogs on the basis of the official carcass grades has been compulsory. Knowing the quality basis of settlements the buyers are able to make firm bids based only on their judgment of market conditions.

The price tapes are prepunched on a declining price scale in drops of five cents per hundredweight. During the teletype auction process, the asking price declines by five cents every two seconds. When a buyer sees the price he is willing to pay he simply presses the buying button and the lot of hogs are his if he is the first bidder.

Each buyer has his code letter and a corresponding red light on the face of the teletype selling machine in the office of the selling agency. The flash of the red light indicates the completion of an auction. As soon as the red light flashes, a confirmation is made between the selling agency and the successful buyer privately through the teletype machine.

Theoretically, the teletype auction is more competitive in bidding for hogs than is the traditional non-mechanized auction. In the traditional auction, a small buyer may be unable to compete freely with the large buyers. Hog prices may be influenced by the dominant buyers. The large buyers are the price makers in the market. They determine the price level which will bring the maximum profit for them. The prices so

determined are probably lower than the price in a perfectly competitive market. The small buyers may be discouraged from bidding aggressively. They are essentially price takers in the market. In this case, it is easy to imagine that the competition for bidding on hogs would not be very strong.

In a teletype auction, if the small buyers bid aggressively the firms responsible remain anonymous. No buyer knows the intentions or actions of his rivals. Buyers are offered hogs at successively lower prices rather than bidding successively higher prices. In order to buy enough hogs to achieve an efficient operation with his existing scale of plant, a packer has to press the buying button before his competitors do. The successful buyer may sometimes bid a higher price than the nearest competitor by a substantial amount. This would result in the producers getting higher average hog prices.

In addition, hog prices in the short run are more flexible and every processor has probably become more sensitive to his delivery cost under the teletype selling system in comparison to the alternative selling methods. In a teletype auction, each buyer has the same opportunity to bid on every lot of hogs offered for sale. Discrimination among sellers is impossible. This helps to insure more competitive bidding on hogs.

Before the introduction of the teletype selling system in Manitoba, the majority of producers avoided paying the yardage and commission fee and chose to sell their hogs by truckers or by themselves, to packing plants directly. Only a small proportion (about 10 per cent) of farmers sold hogs through a commission firm located in the public stock-

yards. Since the voluntary teletype system was instituted in 1965, the Manitoba Hog Marketing Commission levies thirty cents per hog on all hogs of Manitoba origin. Even if hogs are directly sold to a packing plant, the producer still has to pay thirty cents per hog to the Commission. When farmers sell hogs through the Commission by teletype, however, they pay the general levy but they do not need to pay any additional charge. Since 1965, a substantial percentage (about 60 per cent) of the hogs have been marketed through the teletype system. The high percentage presumably ensures a competitive market which acts as a price setter in the Province.

It was suggested in the preceding paragraphs that under the teletype system, the packers are compelled to bid more aggressively for hogs and, therefore, to pay higher prices to producers. The purpose of this research project was to analyze inter-market price differentials prior to and subsequent to the inception of the teletype selling mechanism to determine the effect of the selling system on the level of hog price. Spatial equilibrium theory, in particular Samuelson's spatial equilibrium model respecting price difference in space was employed. Samuelson's model states that the price differential on a homogeneous commodity between two markets just equals the transportation cost. For the purpose of analyzing the specific problem for this study, Samuelson's model has been modified.

There are not any legal restrictions on interregional trade. Usually, the inter-market movement of livestock product is initiated by the packers. In order to avoid extra shrinkage and bruising, shipments

between Winnipeg and Toronto are made in the form of hog carcasses rather than live hogs. The price margin between the packer and the farmer, the wholesaling margin, includes the processing cost and the packer's profit. The nationally organized meat packing companies have slaughter plants in most parts of the country. The processing costs in various cities are assumed to be equal. Before teletype, the marketing system was the same in both markets and the packer's profits were assumed to be the same. Therefore the wholesaling margins, the sum of processing cost plus the packer's profit, would be the same.

According to Samuelson's model, the pork price spread between Toronto and Winnipeg should be equal to the meat transportation cost. Before teletype, the hog price in each market was derived from the pork price by subtracting the same amount of wholesaling margin. The hog price spread would be equal to the meat transportation cost, too.

When teletype was introduced in the Toronto market, it is expected that pork wholesale prices would not be affected in either market, since these prices are determined by the interaction of local supply and demand forces. The inter-market pork wholesale price spread would continue to equal the meat transportation cost. If teletype selling made conditions more competitive in the Toronto market, the packers would be forced to bid more aggressively for hogs and thereby to pay higher prices to producers. Since this increased competition would not change the state of competition among retailers, the packers would receive the same prices from the retailers as they did before teletype. The packers' profits would be reduced in Toronto. Presumably, the processing costs in both

markets and the packers' profits in Manitoba would not be affected. The wholesaling margin in Toronto would be less than that in Winnipeg by the amount of the reduced packers' profits in Toronto. The reduced packer profit would be equivalent to the effect of the Toronto teletype system on hog prices.

If the wholesale prices remained at the same levels in both markets and the wholesaling margin in Toronto was reduced, the hog price spread between Toronto and Winnipeg would be increased. Finally, the inter-market spread for producer hog prices was equal to the meat transportation cost plus the effect of the teletype selling mechanism on hog prices.

In short, the modified spatial equilibrium model stated that the hog price spread equalled the sum of the meat transportation cost plus the effect of the teletype system on hog prices. In the case of hogs the interregional shipments are carried out in the form of final products. In general, the modified spatial equilibrium model assumes that the raw farm product price spread between two markets equals the sum of the cost of transporting the final product between two markets plus the difference in the costs of processing and selling the product in these two markets.

In this study, the monthly and weekly price spreads between Toronto and Winnipeg during the time period from December 1958 to June 1968 were used to analyze the specific problem of measuring the effect of the teletype system on hog prices. The ten year price series was divided into three periods, i.e., Period I (before teletype), Period II (teletype in Ontario only), and Period III (teletype in both Provinces).

Considering the expected price spread in each period: In Period I, based on Samuelson's model, the price spreads were expected to be equal to the transportation costs (T.C.); in Period II, based on the modified spatial equilibrium model, the price spreads were expected to be greater than T.C. If the hypothesis was accepted, it would be concluded that the teletype system in Toronto had a significant effect on price; in Period III, if there was no significant difference between the effect of the Ontario compulsory teletype system and the Manitoba voluntary teletype system, then the price spreads were expected to be equal to T.C. These hypotheses were accepted by the Student-t tests.

Considering the frequency distribution of the net price spread (NPS), here $NPS = \text{price spread} - T.C.$ In Periods I and III, the numbers of positive NPS and the negative NPS were expected to be the same; in Period II, the numbers of positive NPS were expected to be more than that of negative NPS. Those hypotheses were accepted by the Sign-test.

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. APPENDIX

TABLE VI

PERCENTAGE OF GRADED HOGS DELIVERED DIRECT TO PACKING PLANTS
ONTARIO AND MANITOBA, 1922-1966*

Year	Ontario	Manitoba	Year	Ontario	Manitoba
1922	64%	16%	1945	87%	64%
1923	69	21	1946	87	86
1924	68	19	1947	88	85
1925	70	21	1948	90	92
1926	72	18	1949	93	74
1927	72	24	1950	93	76
1928	75	32	1951	94	76
1929	75	34	1952	92	83
1930	76	39	1953	91	68
1931	75	36	1954	91	70
1932	75	47	1955	92	70
1933	72	50	1956	91	68
1934	73	44	1957	90 ^a	60
1935	76	53	1958	82	66
1936	71	57	1959	90	75
1937	68	56	1960	91	77
1938	83	72	1961	92 ^b	78
1939	85	74	1962	88	84
1940	90	77	1963	85	87
1941	86	86	1964	84	90
1942	86	87	1965	84	65 ^c
1943	87	90	1966	83	67
1944	87	93			

*Source: DBS #23-203, Livestock and Animal Product Statistics.

^aIn Ontario the compulsory direction of hogs to specific assembly points was commenced in September, 1957.

^bThe teletype selling system was adopted in 1961 in Ontario.

^cThe teletype selling system was adopted in 1965 in Manitoba.

TABLE VII

PERCENTAGE OF POPULATION ON FARMS IN MANITOBA, 1906-1966*

Year	Farm population	Total population	Per cent on farms
1901	184,775	255,211	72.40
1911	261,029	461,394	56.57
1921	348,502	610,118	57.12
1931	384,170	700,139	54.87
1936	261,167	711,216	36.70
1941	249,599	729,744	34.20
1946	224,919	726,923	30.90
1951	219,233	776,541	28.20
1956	202,163	850,040	23.80
1961	172,946	921,686	18.80
1966	161,662	963,066	16.80

*Source: 1901-1931, DBS, The Canada Year Book, 1941, p. 50 and 64.
 1936-1966, Yearbook of Manitoba Agriculture, 1967, p. 71.

TABLE VIII

ANALYSIS OF VARIANCE FOR TESTING THE HOMOGENEITY OF REGRESSION COEFFICIENTS*

Markets	d.f.	t ²	t _p	b _i	TSS	SSR	SSE	d.f.	MSE
Toronto	29	2,248	27,299	.12	1,491,055	331,584	1,159,471	28	41,410
Winnipeg	29	2,248	32,930	.14	1,543,971	482,470	1,061,501	28	37,911
Residuals from individual regressions							2,220,972	56	39,696
Totals for single regression	58	4,496	60,229	.13	3,035,026		2,228,024	57	
Difference for homogeneity of regressions							7,052	1	

*This technique was taken from: R. G. D. Steel, and J. H. Torrie, Principles and Procedures of Statistics (New York: McGraw-Hill Book Co., 1960), p. 360.

The homogeneity of the regression coefficients for $P_{\text{Tor}} = 23.55 + .12 t$ and $P_{\text{Wbg}} = 20.91 + .14 t$ was tested by the technique of analysis of variance.

$H_0 : b_1 = b_2$ (homogeneity of .12 and .14)

$H_1 : \text{The } b\text{'s are not equal.}$

$F_{1,56} = \frac{7.052}{39.696} = .17 < 4.02$ (the critical value, $F_{1,56} = 4.02$)
accept H_0

It implies that these two lines are parallel. The regression coefficient for the common regression is .13.

TABLE IX

AVERAGE MONTHLY DRESSED GRADE A HOG PRICES IN TORONTO AND
WINNIPEG, DECEMBER 1958 TO APRIL 1961*
unit: \$/cwt.

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Aver.
Toronto average prices	26.14	25.94	24.31	23.86	23.97	25.72	26.15	25.70	26.34	25.36	25.25	26.03	25.39
Winnipeg average prices	23.56	23.12	22.32	22.02	22.07	23.43	23.81	23.76	24.56	23.32	23.21	23.50	23.22
Price differentials	2.58	2.82	1.99	1.84	1.90	2.29	2.34	1.94	1.78	2.04	2.04	2.53	2.17

*See Table XIII.

During the period studied the mean of price differentials was \$2.17 per hundredweight; the standard deviation was 0.33. The confidence interval, at $\alpha = 1$ per cent, was $\bar{x} \pm 3S$ or 2.17 ± 0.99 or \$1.18 to \$3.06. The actual price differences fell within the confidence interval. Therefore, the hypothesis of the conformity of the seasonal hog price movements in Toronto and Winnipeg was accepted.

TABLE X

HOG RECEIPTS IN MANITOBA AT PUBLIC STOCK YARD AND SHIPMENTS DIRECT
FROM COUNTRY POINTS TO PACKING PLANTS, ACCORDING TO
PROVINCE OF ORIGIN, 1957-1966*

From:	Alberta	Saskatchewan	Manitoba	Ontario	Total
1957	56,212	235,989	328,500	161	620,868
1958	86,342	304,814	459,237	172	850,565
1959	101,245	360,328	649,654	233	1,111,460
1960	56,707	203,464	503,925	253	764,349
1961	36,099	204,699	515,433	354	756,585
1962	30,404	185,562	465,100	227	681,693
1963	13,511	132,910	436,523	175	583,119
1964	770	165,236	582,066	96	748,168
1965	7,325	150,675	578,304	206	736,110
1966	1,210	114,334	593,240	301	709,115
10-year Ave	38,983	205,801	511,201	218	756,208
Average %	5.16	27.22	67.60	0.02	100.00

*Source: Livestock Market Review, Dept. of Agriculture, Ottawa, Canada.

TABLE XI

HOG RECEIPTS IN ONTARIO AT PUBLIC STOCK YARD AND SHIPMENTS DIRECT
FROM COUNTRY POINTS TO PACKING PLANTS, ACCORDING TO
PROVINCE OF ORIGIN, 1957-1966*

From:	B.C.	Alberta	Saskat- chewan	Manitoba	Ontario	Quebec	Total
1957	-	9,848	84	3,172	1,865,020	2,990	1,881,114
1958	412	37,435	375	5,183	2,007,211	3,226	2,053,842
1959	-	6,694	1,721	4,028	2,824,146	7,885	2,844,474
1960	-	20,271	4,913	2,282	2,340,728	4,541	2,372,753
1961	-	14,428	1,721	3,820	2,162,693	5,079	2,187,741
1962	-	5,619	928	1,980	2,244,313	5,779	2,258,619
1963	-	853	55	369	2,476,524	4,769	2,482,570
1964	-	380	13	52	2,642,758	4,104	2,647,320
1965	-	5,581	12	167	2,487,709	3,373	2,496,842
1966	-	2,221	9	447	2,485,196	4,570	2,492,443
10-year Ave.	41	10,333	983	2,150	2,353,630	4,632	2,371,771
Average %	a	a	a	a	99.24	a	100.00

*Source: Livestock Market Review, Dept. of Agriculture, Ottawa, Canada.

a Less than 1 per cent.

TABLE XII

RAIL FREIGHT RATES FOR MEAT FROM WINNIPEG TO TORONTO
BY EFFECTIVE DATE*

Date	Freight rates (cents per cwt.)
October 1, 1921	121
April 8, 1948	146
October 11, 1949	158
March 23, 1950	169
June 16, 1950	175
July 26, 1951	196
February 11, 1952	205
May 1, 1952	194
January 1, 1953	212
March 16, 1953	227
May 1, 1953	221
November 1, 1955	214
March 1, 1956	221
July 3, 1956	236
January 1, 1957	246 ^a
March 1, 1957	248 ^b
December 1, 1958	292 ^b
March 1, 1959	289 ^b
April 30, 1959	233 ^c
August 27, 1962	212 ^c
March 1, 1964	220 ^{cd}

*Source: DBS #23-203, Livestock and Animal Products Statistics.

^aBased on minimum carload weight of 21,000 lbs.

^bBased on minimum weight of 21,000 lbs.

^cSuspended, minimum 21,000 lbs.

^dStill in effect on December 31, 1966

TABLE XIII

THE MONTHLY DRESSED GRADE A HOG PRICE SPREAD
BETWEEN TORONTO AND WINNIPEG
DEC 1958 TO APR 1961

UNIT = \$/CWT

YEAR	MONTH	TORONTO PRICE	WINNIPEG PRICE	PRICE SPREAD	FREIGHT RATES	SIGN OF NET PRICE SPREAD
1958	DEC	25.50	22.25	3.25	2.33	+
1959	JAN	25.07	22.41	2.66	2.30	+
1959	FEB	25.00	22.56	2.44	2.30	+
1959	MAR	25.00	22.50	2.50	2.30	+
1959	APR	25.00	22.50	2.50	2.30	+
1959	MAY	25.00	22.55	2.45	2.30	+
1959	JUNE	25.40	22.79	2.61	2.30	+
1959	JULY	25.49	22.77	2.72	2.30	+
1959	AUG	25.00	22.70	2.30	2.16	+
1959	SEPT	25.00	22.74	2.26	2.16	+
1959	OCT	23.77	21.54	2.23	2.16	+
1959	NOV	23.65	21.50	2.15	2.16	-
1959	DEC	23.69	21.50	2.19	2.16	+
1960	JAN	23.29	20.62	2.67	2.16	+
1960	FEB	22.32	19.12	3.20	2.16	+
1960	MAR	20.65	18.57	2.08	2.16	-
1960	APR	21.20	19.85	1.35	2.16	-
1960	MAY	22.94	21.58	1.36	2.12	-
1960	JUNE	26.03	24.07	1.96	2.12	-
1960	JULY	26.81	24.84	1.97	2.12	-
1960	AUG	26.40	24.82	1.58	2.12	-
1960	SEPT	27.67	26.37	1.30	2.12	-
1960	OCT	26.95	25.10	1.85	2.12	-
1960	NOV	26.85	24.91	1.94	2.12	-
1960	DEC	28.89	26.75	2.14	2.12	+
1961	JAN	30.06	27.65	2.41	2.12	+
1961	FEB	30.50	27.69	2.81	2.12	+
1961	MAR	27.28	25.89	1.39	2.12	-
1961	APR	25.38	23.71	1.67	2.12	-
MEANS		25.37	23.17	2.20	2.18	
VARIANCES		5.2280	5.4985			

SOURCES: 1. PRICES: CANADA DEPARTMENT OF AGRICULTURE,
LIVESTOCK AND MEAT TRADE REPORT, OTTAWA

2. FREIGHT RATES: CNR, MIN. 30,000 LBS

TABLE XIV

THE MONTHLY DRESSED GRADE A HOG PRICE SPREAD
 BETWEEN TORONTO AND WINNIPEG
 MAY 1961 TO FEB 1965

UNIT = \$/CWT

YEAR	MONTH	TORONTO PRICE	WINNIPEG PRICE	PRICE SPREAD	FREIGHT RATES	SIGN OF NET PRICE SPREAD
1961	MAY	27.05	23.84	3.21	2.12	+
1961	JUNE	29.53	26.16	3.37	2.12	+
1961	JULY	29.89	27.38	2.51	2.12	+
1961	AUG	28.84	26.77	2.07	2.12	-
1961	SEPT	29.40	26.77	2.63	2.12	+
1961	OCT	28.67	26.26	2.41	2.12	+
1961	NOV	27.61	24.72	2.89	2.12	+
1961	DEC	27.16	24.54	2.62	2.12	+
1962	JAN	26.63	23.66	2.97	2.12	+
1962	FEB	26.83	24.44	2.39	2.12	+
1962	MAR	26.88	24.58	2.30	2.12	+
1962	APRIL	27.23	24.98	2.25	2.12	+
1962	MAY	27.92	27.92	0.0	2.12	-
1962	JUNE	31.09	28.79	2.30	2.12	+
1962	JULY	33.07	30.85	2.22	2.12	+
1962	AUG	32.80	30.74	2.06	2.12	-
1962	SEPT	30.60	28.66	1.94	2.12	-
1962	OCT	29.59	28.02	1.57	1.76	-
1962	NOV	30.30	28.35	1.95	1.76	+
1962	DEC	30.42	28.41	2.01	1.76	+
1963	JAN	30.27	27.96	2.31	1.76	+
1963	FEB	29.83	27.78	2.05	1.76	+
1963	MAR	26.89	25.33	1.56	1.76	-
1963	APRIL	24.25	22.83	1.42	1.76	-
1963	MAY	26.49	24.32	2.17	1.76	+
1963	JUNE	29.55	26.50	3.05	1.76	+
1963	JULY	29.96	27.96	2.00	1.76	+
1963	AUG	28.99	27.41	1.58	1.76	-
1963	SEPT	28.60	26.72	1.88	1.76	+
1963	OCT	26.57	24.64	1.93	1.76	+
1963	NOV	26.32	23.79	2.53	1.76	+
1963	DEC	26.88	24.41	2.47	1.76	+
1964	JAN	26.85	24.12	2.73	1.76	+
1964	FEB	27.61	24.05	3.56	1.76	+
1964	MAR	25.92	23.45	2.47	1.84	+
1964	APRIL	25.38	22.98	2.40	1.84	+
1964	MAY	26.40	23.82	2.58	1.84	+
1964	JUNE	29.08	26.37	2.71	1.84	+
1964	JULY	28.41	25.77	2.64	1.84	+
1964	AUG	28.10	25.39	2.71	1.84	+

CONTINUED

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1964	SEPT	28.24	25.93	2.31	1.84	+
1964	OCT	27.13	24.39	2.74	1.84	+
1964	NOV	27.12	23.84	3.28	1.84	+
1964	DEC	27.63	24.30	3.33	1.84	+
1965	JAN	27.44	23.89	3.55	1.84	+
1965	FEB	28.23	24.75	3.48	1.84	+

MEANS		28.25	25.84	2.42	1.91	
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VARIANCES		3.3357	4.0434			
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SOURCES: 1. PRICES: CANADA DEPARTMENT OF AGRICULTURE,
LIVESTOCK AND MEAT TRADE REPORT, OTTAWA

2. FREIGHT RATES: CNR, MIN. 30,000 LBS

TABLE XV

THE MONTHLY DRESSED GRADE A HOG PRICE SPREAD
BETWEEN TORONTO AND WINNIPEG
MAR 1965 TO MAY 1968

UNIT = \$/CWT

YEAR	MONTH	TORONTO PRICE	WINNIPEG PRICE	PRICE SPREAD	FREIGHT RATES	SIGN OF NET PRICE SPREAD
1965	MAR	27.80	25.70	2.10	1.84	+
1965	APR	27.94	25.73	2.21	1.84	+
1965	MAY	30.46	28.25	2.21	1.84	+
1965	JUNE	34.81	33.00	1.81	1.84	-
1965	JULY	36.24	34.69	1.55	1.84	-
1965	AUG	36.66	34.32	2.34	1.84	+
1965	SEPT	36.88	34.93	1.95	1.84	+
1965	OCT	35.90	34.75	1.15	1.84	-
1965	NOV	37.58	36.42	1.16	1.84	-
1965	DEC	41.64	39.70	1.94	1.84	+
1966	JAN	42.73	40.76	1.97	1.84	+
1966	FEB	43.19	42.28	0.91	1.84	-
1966	MAR	36.12	35.05	1.07	1.84	-
1966	APR	32.90	31.64	1.26	1.84	-
1966	MAY	36.83	35.54	1.29	1.84	-
1966	JUNE	38.29	36.35	1.94	1.84	+
1966	JULY	35.12	33.28	1.84	1.84	0
1966	AUG	33.98	34.63	-0.65	1.84	-
1966	SEPT	33.92	33.68	0.24	1.84	-
1966	OCT	33.94	32.12	1.82	1.84	-
1966	NOV	33.79	30.52	3.27	1.84	+
1966	DEC	33.00	30.13	2.87	1.84	+
1967	JAN	32.31	29.70	2.61	1.84	+
1967	FEB	33.39	30.37	3.02	1.84	+
1967	MAR	31.69	28.90	2.79	1.84	+
1967	APR	30.93	27.60	3.33	1.84	+
1967	MAY	32.52	30.33	2.19	2.01	+
1967	JUNE	32.38	29.97	2.41	2.01	+
1967	JULY	30.44	27.82	2.62	2.01	+
1967	AUG	30.26	28.46	1.80	2.01	-
1967	SEPT	30.08	28.65	1.43	2.01	-
1967	OCT	29.23	27.87	1.36	2.01	-
1967	NOV	27.73	26.35	1.38	2.01	-
1967	DEC	28.74	26.86	1.88	2.01	-
1968	JAN	28.11	25.78	2.33	2.01	+
1968	FEB	28.60	26.40	2.20	2.01	+
1968	MAR	27.97	26.33	1.64	2.01	-
1968	APR	26.98	25.49	1.49	2.01	-
1968	MAY	28.27	26.65	1.62	2.01	-
MEANS		33.06	31.21	1.86	1.90	
VARIANCES		17.9231	19.7644			

SOURCES: SEE TABLE XIII

TABLE XVI

THE WEEKLY DRESSED GRADE A HOG PRICE SPREAD
BETWEEN TORONTO AND WINNIPEG
DEC 1958 TO APR 1961

UNIT = \$/CWT

=====							
YEAR	WEEK	END	TORONTO PRICE	WINNIPEG PRICE	PRICE SPREAD	FREIGHT RATES	SIGN OF NET PRICE SPREAD

1958	DEC	6	25.50	22.25	3.25	2.30	+
1958	DEC	13	25.50	22.25	3.25	2.30	+
1958	DEC	20	25.50	22.25	3.25	2.30	+
1958	DEC	27	25.50	22.25	3.25	2.30	+
1958	DEC	31	25.50	22.25	3.25	2.30	+
1959	JAN	10	25.25	22.25	3.00	2.30	+
1959	JAN	17	25.00	22.25	2.75	2.30	+
1959	JAN	24	25.00	22.33	2.67	2.30	+
1959	JAN	31	25.00	22.83	2.17	2.30	-
1959	FEB	7	25.00	22.41	2.59	2.30	+
1959	FEB	14	25.00	22.50	2.50	2.30	+
1959	FEB	21	25.00	22.62	2.38	2.30	+
1959	FEB	28	25.00	22.56	2.44	2.30	+
1959	MAR	7	25.00	22.50	2.50	2.30	+
1959	MAR	14	25.00	22.50	2.50	2.30	+
1959	MAR	21	25.00	22.50	2.50	2.30	+
1959	MAR	28	25.00	22.50	2.50	2.30	+
1959	APRI	4	25.00	22.50	2.50	2.30	+
1959	APRI	11	25.00	22.50	2.50	2.30	+
1959	APRI	18	25.00	22.50	2.50	2.30	+
1959	APRI	25	25.00	22.50	2.50	2.30	+
1959	MAY	2	25.00	22.50	2.50	2.30	+
1959	MAY	9	25.00	22.50	2.50	2.30	+
1959	MAY	16	25.00	22.50	2.50	2.30	+
1959	MAY	23	25.00	22.50	2.50	2.30	+
1959	MAY	30	25.00	22.75	2.25	2.30	-
1959	JUNE	6	25.25	22.75	2.50	2.30	+
1959	JUNE	13	25.25	22.75	2.50	2.30	+
1959	JUNE	20	25.25	22.75	2.50	2.30	+
1959	JUNE	27	25.55	22.75	2.80	2.30	+
1959	JULY	4	25.75	23.00	2.75	2.30	+
1959	JULY	11	25.75	23.00	2.75	2.30	+
1959	JULY	18	25.70	22.83	2.87	2.30	+
1959	JULY	25	25.25	22.56	2.69	2.30	+
1959	AUG	1	25.25	22.62	2.63	2.16	+
1959	AUG	8	25.00	22.62	2.38	2.16	+
1959	AUG	15	25.00	22.70	2.30	2.16	+
1959	AUG	22	25.00	22.75	2.25	2.16	+
1959	AUG	29	25.00	22.75	2.25	2.16	+
1959	SEPT	5	25.00	22.75	2.25	2.16	+

CONTINUE

1959	SEPT	12	25.00	23.12	1.88	2.16	-
1959	SEPT	19	25.00	22.91	2.09	2.16	-
1959	SEPT	26	25.00	22.83	2.17	2.16	+
1959	OCT	3	25.00	22.20	2.80	2.16	+
1959	OCT	10	24.32	21.75	2.57	2.16	+
1959	OCT	17	23.65	21.50	2.15	2.16	-
1959	OCT	24	23.65	21.50	2.15	2.16	-
1959	OCT	31	23.65	21.50	2.15	2.16	-
1959	NOV	7	23.65	21.50	2.15	2.16	-
1959	NOV	14	23.65	21.50	2.15	2.16	-
1959	NOV	21	23.65	21.50	2.15	2.16	-
1959	NOV	28	23.65	21.50	2.15	2.16	-
1959	DEC	5	23.65	21.50	2.15	2.16	-
1959	DEC	12	23.65	21.50	2.15	2.16	-
1959	DEC	19	23.70	21.50	2.20	2.16	+
1959	DEC	26	23.77	21.50	2.27	2.16	+
1959	DEC	31	23.70	21.50	2.20	2.16	+
1960	JAN	9	23.65	21.50	2.15	2.16	-
1960	JAN	16	23.90	21.31	2.59	2.16	+
1960	JAN	23	23.65	20.25	3.40	2.16	+
1960	JAN	30	21.31	18.95	2.36	2.16	+
1960	FEB	6	23.37	19.29	4.08	2.16	+
1960	FEB	13	22.68	19.33	3.35	2.16	+
1960	FEB	20	22.18	19.25	2.93	2.16	+
1960	FEB	27	20.75	18.50	2.25	2.16	+
1960	MAR	5	19.00	17.25	1.75	2.16	-
1960	MAR	12	19.00	17.25	1.75	2.16	-
1960	MAR	19	20.40	18.16	2.24	2.16	+
1960	MAR	26	22.50	20.16	2.34	2.16	+
1960	APR	2	22.12	20.16	1.96	2.16	-
1960	APR	9	21.00	19.08	1.92	2.16	-
1960	APR	16	21.00	19.33	1.67	2.16	-
1960	APR	23	21.00	20.04	0.96	2.16	-
1960	APR	30	21.83	20.87	0.96	2.16	-
1960	MAY	7	22.25	21.83	0.42	2.12	-
1960	MAY	14	22.32	21.25	1.07	2.12	-
1960	MAY	21	23.12	21.41	1.71	2.12	-
1960	MAY	28	24.06	21.93	2.13	2.12	+
1960	JUNE	4	23.50	22.12	1.38	2.12	-
1960	JUNE	11	25.37	23.45	1.92	2.12	-
1960	JUNE	18	26.75	24.33	2.42	2.12	+
1960	JUNE	25	27.57	25.25	2.32	2.12	+
1960	JULY	2	27.00	25.66	1.34	2.12	-
1960	JULY	9	26.12	24.08	2.04	2.12	-
1960	JULY	16	26.87	24.70	2.17	2.12	+
1960	JULY	23	27.15	25.20	1.95	2.12	-
1960	JULY	30	27.00	24.25	2.75	2.12	+
1960	AUG	6	26.00	24.75	1.25	2.12	-
1960	AUG	13	26.00	24.25	1.75	2.12	-
1960	AUG	20	26.12	24.66	1.46	2.12	-

CONTINUE

1960	AUG	27	27.40	25.75	1.65	2.12	-
1960	SEPT	3	27.06	25.58	1.48	2.12	-
1960	SEPT	10	27.00	25.87	1.13	2.12	-
1960	SEPT	17	27.03	26.33	0.70	2.12	-
1960	SEPT	24	28.33	26.66	1.67	2.12	-
1960	OCT	1	28.62	27.00	1.62	2.12	-
1960	OCT	8	27.50	26.50	1.00	2.12	-
1960	OCT	15	28.12	25.62	2.50	2.12	+
1960	OCT	22	26.25	24.58	1.67	2.12	-
1960	OCT	29	26.00	24.25	1.75	2.12	-
1960	NOV	5	26.00	24.25	1.75	2.12	-
1960	NOV	12	26.10	24.25	1.85	2.12	-
1960	NOV	19	26.91	24.75	2.16	2.12	+
1960	NOV	26	28.16	26.25	1.91	2.12	-
1960	DEC	3	28.66	26.33	2.33	2.12	+
1960	DEC	10	29.33	27.33	2.00	2.12	-
1960	DEC	17	29.20	26.75	2.45	2.12	+
1960	DEC	24	28.75	27.00	1.75	2.12	-
1960	DEC	31	28.25	26.25	2.00	2.12	-
1961	JAN	7	29.57	27.00	2.57	2.12	+
1961	JAN	14	29.90	27.33	2.57	2.12	+
1961	JAN	21	30.83	28.25	2.58	2.12	+
1961	JAN	28	30.16	27.91	2.25	2.12	+
1961	FEB	4	29.50	27.35	2.15	2.12	+
1961	FEB	11	29.50	27.66	1.84	2.12	-
1961	FEB	18	29.50	27.75	1.75	2.12	-
1961	FEB	25	29.50	27.95	1.55	2.12	-
1961	MAR	4	29.33	27.83	1.50	2.12	-
1961	MAR	11	28.50	26.75	1.75	2.12	-
1961	MAR	18	27.00	25.75	1.25	2.12	-
1961	MAR	25	25.83	24.66	1.17	2.12	-
1961	APR	1	25.50	24.00	1.50	2.12	-
1961	APR	8	25.50	24.08	1.42	2.12	-
1961	APR	15	25.50	24.00	1.50	2.12	-
1961	APR	22	25.50	23.50	2.00	2.12	-
1961	APR	22	25.50	23.50	2.00	2.12	-
1961	APR	29	25.00	23.29	1.71	2.12	-
1961	MAY	6	24.95	22.75	2.20	2.12	+
MEANS			25.33	23.17	2.17	2.18	
VARIANCES			5.1624	5.6166			

SOURCES: 1. PRICES: CANADA DEPARTMENT OF AGRICULTURE,
LIVESTOCK AND MEAT TRADE REPORT, OTTAWA

2. FREIGHT RATES: CNR, MIN. 30,000 LBS

TABLE XVII

THE WEEKLY DRESSED GRADE A HOG PRICE SPREAD
 BETWEEN TORONTO AND WINNIPEG
 MAY 1961 TO FEB 1965

UNIT = \$/CWT

=====							
YEAR	WEEK	END	TORONTO PRICE	WINNIPEG PRICE	PRICE SPREAD	FREIGHT RATES	SIGN OF NET PRICE SPREAD

1961	MAY	13	26.50	24.31	2.19	2.12	+
1961	MAY	20	28.25	24.33	3.92	2.12	+
1961	MAY	27	27.50	25.10	2.40	2.12	+
1961	JUNE	3	30.10	25.75	4.35	2.12	+
1961	JUNE	10	30.48	26.25	4.23	2.12	+
1961	JUNE	17	29.58	26.50	3.08	2.12	+
1961	JUNE	24	28.68	25.91	2.77	2.12	+
1961	JULY	1	29.51	26.41	3.10	2.12	+
1961	JULY	8	29.46	26.75	2.71	2.12	+
1961	JULY	15	30.75	27.25	3.50	2.12	+
1961	JULY	22	30.65	27.83	2.82	2.12	+
1961	JULY	29	28.70	27.58	1.12	2.12	-
1961	AUG	5	28.53	27.16	1.37	2.12	-
1961	AUG	12	27.75	26.50	1.25	2.12	-
1961	AUG	19	29.00	26.33	2.67	2.12	+
1961	AUG	26	29.97	27.00	2.97	2.12	+
1961	SEPT	2	29.63	27.12	2.51	2.12	+
1961	SEPT	7	29.26	26.68	2.58	2.12	+
1961	SEPT	16	29.26	26.41	2.85	2.12	+
1961	SEPT	23	29.78	26.66	3.12	2.12	+
1961	SEPT	30	29.40	27.00	2.40	2.12	+
1961	OCT	7	29.32	26.75	2.57	2.12	+
1961	OCT	14	28.96	27.00	1.96	2.12	-
1961	OCT	21	28.51	26.29	2.22	2.12	+
1961	OCT	28	27.93	25.25	2.68	2.12	+
1961	NOV	4	27.18	24.25	2.93	2.12	+
1961	NOV	11	27.35	24.41	2.94	2.12	+
1961	NOV	18	27.85	24.91	2.94	2.12	+
1961	NOV	25	28.05	25.25	2.80	2.12	+
1961	DEC	2	28.18	25.29	2.89	2.12	+
1961	DEC	9	27.68	25.45	2.23	2.12	+
1961	DEC	16	26.47	24.20	2.27	2.12	+
1961	DEC	23	26.15	23.66	2.49	2.12	+
1961	DEC	30	27.45	23.62	3.83	2.12	+
1962	JAN	6	26.45	23.62	2.83	2.12	+
1962	JAN	13	26.62	23.29	3.33	2.12	+
1962	JAN	20	26.73	23.75	2.98	2.12	+
1962	JAN	27	26.75	24.00	2.75	2.12	+
1962	FEB	3	26.96	24.08	2.88	2.12	+
1962	FEB	10	27.15	24.62	2.53	2.12	+

CONTINUED

1962	FEB	17	27.00	24.00	3.00	2.12	+
1962	FEB	24	26.26	24.15	2.11	2.12	-
1962	MAR	3	26.50	24.25	2.25	2.12	+
1962	MAR	10	27.10	24.55	2.55	2.12	+
1962	MAR	17	26.85	24.60	2.25	2.12	+
1962	MAR	24	27.07	24.75	2.32	2.12	+
1962	MAR	31	26.85	24.75	2.10	2.12	-
1962	APRI	7	27.10	24.75	2.35	2.12	+
1962	APRI	14	27.20	25.00	2.20	2.12	+
1962	APRI	21	27.26	25.16	2.10	2.12	-
1962	APRI	28	27.40	25.15	2.25	2.12	+
1962	MAY	5	27.32	25.41	1.91	2.12	-
1962	MAY	12	28.18	25.50	2.68	2.12	+
1962	MAY	19	28.43	26.33	2.10	2.12	-
1962	MAY	26	27.90	26.25	1.65	2.12	-
1962	JUNE	2	29.37	27.08	2.29	2.12	+
1962	JUNE	9	30.57	28.50	2.07	2.12	-
1962	JUNE	16	31.58	29.25	2.33	2.12	+
1962	JUNE	23	31.97	29.75	2.22	2.12	+
1962	JUNE	30	31.52	29.85	1.67	2.12	-
1962	JULY	7	32.13	30.00	2.13	2.12	+
1962	JULY	14	33.20	30.60	2.60	2.12	+
1962	JULY	21	33.45	31.10	2.35	2.12	+
1962	JULY	28	33.45	31.60	1.85	2.12	-
1962	AUG	4	33.51	31.12	2.39	2.12	+
1962	AUG	11	32.30	30.10	2.20	2.12	+
1962	AUG	18	32.71	30.50	2.21	2.12	+
1962	AUG	25	32.90	31.15	1.75	2.12	-
1962	SEPT	1	29.97	29.25	0.72	2.12	-
1962	SEPT	8	29.05	27.70	1.35	2.12	-
1962	SEPT	15	30.00	28.00	2.00	2.12	-
1962	SEPT	22	31.56	29.25	2.31	2.12	+
1962	SEPT	29	31.66	29.25	2.41	1.76	+
1962	OCT	13	28.81	28.25	0.56	1.76	-
1962	OCT	6	30.86	29.50	1.36	1.76	-
1962	OCT	20	29.60	27.50	2.10	1.76	+
1962	OCT	27	29.25	27.00	2.25	1.76	+
1962	NOV	3	29.22	27.50	1.72	1.76	-
1962	NOV	10	30.82	28.50	2.32	1.76	+
1962	NOV	17	30.31	28.75	1.56	1.76	-
1962	NOV	24	30.83	28.75	2.08	1.76	+
1962	DEC	1	31.06	29.05	2.01	1.76	+
1962	DEC	8	31.27	28.90	2.37	1.76	+
1962	DEC	15	30.05	28.50	1.55	1.76	-
1962	DEC	22	29.20	27.50	1.70	1.76	-
1962	DEC	29	30.81	27.50	3.31	1.76	+
1963	JAN	5	30.28	28.00	2.28	1.76	+
1963	JAN	12	29.48	27.00	2.48	1.76	+
1963	JAN	19	30.00	28.00	2.00	1.76	+
1963	JAN	26	31.41	29.25	2.16	1.76	+

CONTINUED

1963	FFB	2	29.98	28.25	1.73	1.76	-
1963	FEB	9	30.31	28.25	2.06	1.76	+
1963	FEB	16	29.50	27.25	2.25	1.76	+
1963	FEB	23	29.78	27.50	2.28	1.76	+
1963	MAR	2	28.86	27.25	1.61	1.76	-
1963	MAR	9	27.35	25.60	1.75	1.76	-
1963	MAR	16	26.71	25.00	1.71	1.76	-
1963	MAR	23	25.91	24.25	1.66	1.76	-
1963	MAR	30	25.57	24.50	1.07	1.76	-
1963	APRI	6	23.86	23.00	0.86	1.76	-
1963	APRI	13	24.70	22.90	1.80	1.76	+
1963	APRI	20	24.30	22.85	1.45	1.76	-
1963	APRI	27	24.26	22.65	1.61	1.76	-
1963	MAY	4	25.46	23.50	1.96	1.76	+
1963	MAY	11	26.48	24.35	2.13	1.76	+
1963	MAY	18	26.95	24.80	2.15	1.76	+
1963	MAY	25	27.16	24.85	2.31	1.76	+
1963	JUNE	1	28.59	26.25	2.34	1.76	+
1963	JUNE	8	30.22	28.15	2.07	1.76	+
1963	JUNE	15	29.47	27.50	1.97	1.76	+
1963	JUNE	22	30.20	28.00	2.20	1.76	+
1963	JUNE	29	29.28	27.75	1.53	1.76	-
1963	JULY	6	29.25	27.60	1.65	1.76	-
1963	JULY	13	30.02	27.75	2.27	1.76	+
1963	JULY	20	30.28	28.25	2.03	1.76	+
1963	JULY	27	30.22	28.30	1.92	1.76	+
1963	AUG	3	28.70	27.50	1.20	1.76	-
1963	AUG	10	28.46	27.10	1.36	1.76	-
1963	AUG	17	29.00	27.35	1.65	1.76	-
1963	AUG	24	29.75	27.75	2.00	1.76	+
1963	AUG	31	28.81	27.25	1.56	1.76	-
1963	SEPT	7	27.70	26.00	1.70	1.76	-
1963	SEPT	14	28.56	26.40	2.16	1.76	+
1963	SEPT	21	29.29	27.25	2.04	1.76	+
1963	SEPT	28	28.48	26.55	1.93	1.76	+
1963	OCT	5	27.70	26.00	1.70	1.76	-
1963	OCT	12	26.91	25.00	1.91	1.76	+
1963	OCT	19	26.15	24.25	1.90	1.76	+
1963	OCT	26	25.63	23.50	2.13	1.76	+
1963	NOV	2	25.45	23.00	2.45	1.76	+
1963	NOV	9	26.40	23.75	2.65	1.76	+
1963	NOV	16	26.94	24.40	2.54	1.76	+
1963	NOV	23	26.47	24.15	2.32	1.76	+
1963	NOV	30	26.95	24.40	2.55	1.76	+
1963	DEC	7	26.57	24.50	2.07	1.76	+
1963	DEC	14	26.75	24.20	2.55	1.76	+
1963	DEC	21	26.69	24.25	2.44	1.76	+
1963	DEC	28	28.41	24.65	3.76	1.76	+
1964	JAN	4	26.84	24.25	2.59	1.76	+
1964	JAN	11	26.10	23.70	2.40	1.76	+

CONTINUED

1964	JAN	18	27.41	24.35	3.06	1.76	+
1964	JAN	25	27.26	24.50	2.76	1.76	+
1964	FEB	1	27.78	25.25	2.53	1.76	+
1964	FFB	8	27.52	24.90	2.62	1.76	+
1964	FEB	15	27.75	25.00	2.75	1.76	+
1964	FFB	22	27.43	25.00	2.43	1.76	+
1964	FEB	29	26.51	23.75	2.76	1.76	+
1964	MAR	7	26.24	23.60	2.64	1.84	+
1964	MAR	14	25.97	23.50	2.47	1.84	+
1964	MAR	21	25.60	23.15	2.45	1.84	+
1964	MAR	28	25.36	23.10	2.26	1.84	+
1964	APRI	4	25.24	22.75	2.49	1.84	+
1964	APRI	11	25.45	23.00	2.45	1.84	+
1964	APRI	18	25.31	23.00	2.31	1.84	+
1964	APRI	25	25.55	23.20	2.35	1.84	+
1964	MAY	2	25.81	23.25	2.56	1.84	+
1964	MAY	9	26.70	23.75	2.95	1.84	+
1964	MAY	16	26.39	24.10	2.29	1.84	+
1964	MAY	23	26.78	24.30	2.48	1.84	+
1964	MAY	30	27.97	25.00	2.97	1.84	+
1964	JUNE	6	29.32	26.25	3.07	1.84	+
1964	JUNE	13	30.00	27.35	2.65	1.84	+
1964	JUNE	20	29.82	27.10	2.72	1.84	+
1964	JUNE	27	28.42	26.25	2.17	1.84	+
1964	JULY	4	28.62	25.85	2.77	1.84	+
1964	JULY	11	28.44	25.75	2.69	1.84	+
1964	JULY	18	28.26	25.75	2.51	1.84	+
1964	JULY	25	28.36	25.75	2.61	1.84	+
1964	AUG	1	27.69	25.25	2.44	1.84	+
1964	AUG	8	27.17	24.65	2.52	1.84	+
1964	AUG	15	28.49	25.75	2.74	1.84	+
1964	AUG	22	28.92	26.15	2.77	1.84	+
1964	AUG	29	28.58	26.15	2.43	1.84	+
1964	SEPT	5	28.47	26.25	2.22	1.84	+
1964	SEPT	12	28.02	25.85	2.17	1.84	+
1964	SEPT	19	28.22	25.70	2.52	1.84	+
1964	SEPT	26	27.94	25.70	2.24	1.84	+
1964	OCT	3	27.94	25.30	2.64	1.84	+
1964	OCT	10	27.00	24.25	2.75	1.84	+
1964	OCT	17	27.33	24.50	2.83	1.84	+
1964	OCT	24	26.31	23.75	2.56	1.84	+
1964	OCT	31	26.77	23.75	3.02	1.84	+
1964	NOV	7	27.11	24.15	2.96	1.84	+
1964	NOV	14	27.26	24.50	2.76	1.84	+
1964	NOV	21	27.36	24.40	2.96	1.84	+
1964	NOV	28	27.55	24.50	3.05	1.84	+
1964	DEC	5	28.03	24.75	3.28	1.84	+
1964	DEC	12	27.67	24.50	3.17	1.84	+
1964	DEC	19	26.86	23.85	3.01	1.84	+
1964	DEC	26	27.15	24.00	3.15	1.84	+

CONTINUED

1964	DEC	31	26.95	24.00	2.95	1.84	+
1965	JAN	9	26.74	23.60	3.14	1.84	+
1965	JAN	16	27.09	23.80	3.29	1.84	+
1965	JAN	23	28.12	24.00	4.12	1.84	+
1965	JAN	30	28.01	24.20	3.81	1.84	+
1965	FEB	6	28.80	24.65	4.15	1.84	+
1965	FEB	13	28.40	25.00	3.40	1.84	+
1965	FEB	20	27.52	24.55	2.97	1.84	+
1965	FEB	27	28.21	24.90	3.31	1.84	+

MEANS			28.29	25.88	2.40	1.91	
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VARIANCES			3.5267	4.0099			
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SOURCES: 1. PRICES: CANADA DEPARTMENT OF AGRICULTURE,
LIVESTOCK AND MEAT TRADE REPORT, OTTAWA

2. FREIGHT RATES: CNR, MIN. 30,000 LBS

TABLE XVIII

THE WEEKLY DRESSED GRADE A HOG PRICE SPREAD
 BETWEEN TORONTO AND WINNIPEG
 MAR 1965 TO MAY 1968

UNIT = \$/CWT

YEAR	WEEK	END	TORONTO PRICE	WINNIPEG PRICE	PRICE SPREAD	FREIGHT RATES	SIGN OF NET PRICE SPREAD
1965	MAR	6	27.65	25.45	2.20	1.84	+
1965	MAR	13	27.50	25.50	2.00	1.84	+
1965	MAR	20	27.56	25.50	2.06	1.84	+
1965	MAR	27	28.12	26.45	1.67	1.84	-
1965	APRI	3	28.21	25.75	2.46	1.84	+
1965	APRI	10	28.04	26.10	1.94	1.84	+
1965	APRI	17	27.52	25.65	1.87	1.84	+
1965	APRI	24	27.86	25.45	2.41	1.84	+
1965	MAY	1	28.28	25.80	2.48	1.84	+
1965	MAY	8	29.06	27.00	2.06	1.84	+
1965	MAY	15	30.06	27.73	2.33	1.84	+
1965	MAY	22	30.91	28.75	2.16	1.84	+
1965	MAY	29	32.02	29.62	2.40	1.84	+
1965	JUNE	5	32.93	30.89	2.04	1.84	+
1965	JUNE	12	34.35	32.80	1.55	1.84	-
1965	JUNE	19	35.19	33.27	1.92	1.84	+
1965	JUNE	26	36.09	34.20	1.89	1.84	+
1965	JULY	3	35.89	34.27	1.62	1.84	-
1965	JULY	10	35.44	34.20	1.24	1.84	-
1965	JULY	17	36.30	34.55	1.75	1.84	-
1965	JULY	24	36.67	34.75	1.92	1.84	+
1965	JULY	31	36.68	35.39	1.29	1.84	-
1965	AUG	7	36.15	34.10	2.05	1.84	+
1965	AUG	14	36.32	33.99	2.33	1.84	+
1965	AUG	21	36.85	34.12	2.73	1.84	+
1965	AUG	28	37.36	34.94	2.42	1.84	+
1965	SEPT	4	36.88	33.72	3.16	1.84	+
1965	SEPT	11	36.70	34.13	2.57	1.84	+
1965	SEPT	18	36.54	34.24	2.30	1.84	+
1965	SEPT	27	37.09	36.06	1.03	1.84	-
1965	OCT	2	37.21	36.21	1.00	1.84	-
1965	OCT	9	36.88	36.62	0.26	1.84	-
1965	OCT	16	35.89	34.83	1.06	1.84	-
1965	OCT	23	35.63	34.52	1.11	1.84	-
1965	OCT	30	35.32	33.63	1.69	1.84	-
1965	NOV	6	36.13	34.89	1.24	1.84	-
1965	NOV	13	37.04	35.72	1.32	1.84	-
1965	NOV	20	38.16	36.90	1.26	1.84	-
1965	NOV	27	39.06	38.24	0.82	1.84	-
1965	DEC	4	40.29	39.62	0.67	1.84	-

CONTINUED

1965	DEC	11	42.36	41.00	1.36	1.84	-
1965	DEC	18	41.76	38.80	2.96	1.84	+
1965	DEC	25	41.65	38.69	2.96	1.84	+
1965	DEC	31	42.47	40.65	1.82	1.84	-
1966	JAN	8	41.70	39.44	2.26	1.84	+
1966	JAN	15	43.00	40.00	3.00	1.84	+
1966	JAN	22	43.01	41.34	1.67	1.84	-
1966	JAN	29	43.41	42.07	1.34	1.84	-
1966	FEB	5	44.05	42.62	1.43	1.84	-
1966	FEB	12	44.00	42.68	1.32	1.84	-
1966	FEB	19	43.28	43.08	0.20	1.84	-
1966	FEB	26	41.43	40.42	1.01	1.84	-
1966	MAR	5	40.00	39.25	0.75	1.84	-
1966	MAR	12	37.28	37.10	0.18	1.84	-
1966	MAR	19	34.46	33.23	1.23	1.84	-
1966	MAR	26	34.64	33.34	1.30	1.84	-
1966	APRI	2	34.45	32.95	1.50	1.84	-
1966	APRI	9	33.23	30.39	2.84	1.84	+
1966	APRI	16	33.10	31.87	1.23	1.84	-
1966	APRI	23	32.49	31.77	0.72	1.84	-
1966	APRI	30	32.90	32.40	0.50	1.84	-
1966	MAY	7	34.56	33.46	1.10	1.84	-
1966	MAY	14	37.35	34.54	2.81	1.84	+
1966	MAY	21	37.99	36.93	1.06	1.84	-
1966	MAY	28	37.75	37.14	0.61	1.84	-
1966	JUNE	4	38.02	26.93	11.09	1.84	+
1966	JUNE	11	38.53	36.87	1.66	1.84	-
1966	JUNE	18	38.39	36.50	1.89	1.84	+
1966	JUNE	25	38.64	36.01	2.63	1.84	+
1966	JULY	2	37.79	34.91	2.88	1.84	+
1966	JULY	9	35.92	32.48	3.44	1.84	+
1966	JULY	16	34.98	32.82	2.16	1.84	+
1966	JULY	23	34.54	33.55	0.99	1.84	-
1966	JULY	30	34.97	34.58	0.39	1.84	-
1966	AUG	6	33.80	33.24	0.56	1.84	-
1966	AUG	13	34.22	34.99	-0.77	1.84	-
1966	AUG	20	33.89	35.80	-1.91	1.84	-
1966	AUG	27	34.00	34.94	-0.94	1.84	-
1966	SEPT	3	34.23	34.20	0.03	1.84	-
1966	SEPT	10	34.10	33.79	0.31	1.84	-
1966	SEPT	17	33.89	33.59	0.30	1.84	-
1966	SEPT	24	33.73	34.35	-0.62	1.84	-
1966	OCT	1	33.76	32.75	1.01	1.84	-
1966	OCT	8	34.30	33.49	0.81	1.84	-
1966	OCT	15	33.88	33.51	0.37	1.84	-
1966	OCT	22	33.62	32.33	1.29	1.84	-
1966	OCT	29	33.99	29.83	4.16	1.84	+
1966	NOV	5	30.85	30.04	0.81	1.84	-
1966	NOV	12	33.64	30.16	3.48	1.84	+
1966	NOV	19	33.66	30.36	3.30	1.84	+

CONTINUED

1966	NOV	26	34.02	31.55	2.47	1.84	+
1966	DEC	3	33.49	31.92	1.57	1.84	-
1966	DEC	10	33.61	31.66	1.95	1.84	+
1966	DEC	17	32.77	29.18	3.59	1.84	+
1966	DEC	24	31.75	28.36	3.39	1.84	+
1966	DEC	31	33.30	29.59	3.71	1.84	+
1967	JAN	7	31.67	28.46	3.21	1.84	+
1967	JAN	14	31.99	29.45	2.54	1.84	+
1967	JAN	21	32.55	31.25	1.30	1.84	-
1967	JAN	28	33.04	29.39	3.65	1.84	+
1967	FEB	4	33.32	30.49	2.83	1.84	+
1967	FEB	11	33.97	30.04	3.93	1.84	+
1967	FEB	18	32.99	30.53	2.46	1.84	+
1967	FEB	25	33.28	30.63	2.65	1.84	+
1967	MAR	4	33.73	29.90	3.83	1.84	+
1967	MAR	11	32.40	30.03	2.37	1.84	+
1967	MAR	18	31.16	28.55	2.61	1.84	+
1967	MAR	25	31.03	28.25	2.78	1.84	+
1967	APRI	1	30.17	27.79	2.38	1.84	+
1967	APRI	8	30.08	27.92	2.16	1.84	+
1967	APRI	15	29.85	28.06	1.79	1.84	-
1967	APRI	22	29.52	27.21	2.31	1.84	+
1967	APRI	29	30.25	27.20	3.05	1.84	+
1967	MAY	6	31.10	28.55	2.55	2.01	+
1967	MAY	13	32.17	29.20	2.97	2.01	+
1967	MAY	20	33.68	31.72	1.96	2.01	-
1967	MAY	27	33.32	31.97	1.35	2.01	-
1967	JUNE	3	33.23	31.46	1.77	2.01	-
1967	JUNE	10	33.07	30.90	2.17	2.01	+
1967	JUNE	17	32.41	29.51	2.90	2.01	+
1967	JUNE	24	31.99	29.10	2.89	2.01	+
1967	JULY	1	30.96	28.53	2.43	2.01	+
1967	JULY	8	30.72	28.12	2.60	2.01	+
1967	JULY	15	30.08	27.41	2.67	2.01	+
1967	JULY	22	30.37	27.85	2.52	2.01	+
1967	JULY	29	30.63	27.99	2.64	2.01	+
1967	AUG	5	30.25	27.75	2.50	2.01	+
1967	AUG	12	29.85	28.29	1.56	2.01	-
1967	AUG	19	30.35	28.57	1.78	2.01	-
1967	AUG	26	30.57	29.15	1.42	2.01	-
1967	SEPT	2	29.94	29.22	0.72	2.01	-
1967	SEPT	9	29.86	28.66	1.20	2.01	-
1967	SEPT	16	30.12	28.62	1.50	2.01	-
1967	SEPT	23	30.22	28.07	2.15	2.01	+
1967	SEPT	30	30.26	28.85	1.41	2.01	-
1967	OCT	7	30.19	28.87	1.32	2.01	-
1967	OCT	14	29.45	27.98	1.47	2.01	-
1967	OCT	21	28.98	27.59	1.39	2.01	-
1967	OCT	28	28.45	27.36	1.09	2.01	-
1967	NOV	4	27.85	26.58	1.27	2.01	-

CONTINUED

1967	NOV	11	27.18	25.95	1.23	2.01	-
1967	NOV	18	27.60	26.15	1.45	2.01	-
1967	NOV	25	28.26	26.69	1.57	2.01	-
1967	DEC	2	29.07	27.64	1.43	2.01	-
1967	DEC	9	29.63	27.43	2.20	2.01	+
1967	DEC	18	28.62	26.96	1.66	2.01	-
1967	DEC	23	27.63	25.55	2.08	2.01	+
1967	DEC	30	28.38	26.42	1.96	2.01	-
1968	JAN	13	28.70	26.18	2.52	2.01	+
1968	JAN	20	28.34	25.13	3.21	2.01	+
1968	JAN	6	27.36	26.04	1.32	2.01	-
1968	JAN	27	28.02	25.87	2.15	2.01	+
1968	FEB	3	28.38	26.17	2.21	2.01	+
1968	FEB	10	28.10	26.35	1.75	2.01	-
1968	FEB	17	28.94	26.52	2.42	2.01	+
1968	FEB	24	29.07	26.50	2.57	2.01	+
1968	MAR	2	28.76	26.99	1.77	2.01	-
1968	MAR	9	28.49	27.01	1.48	2.01	-
1968	MAR	16	27.99	26.11	1.88	2.01	-
1968	MAR	23	27.39	25.93	1.46	2.01	-
1968	MAR	30	27.13	25.53	1.60	2.01	-
1968	APRI	6	27.02	25.80	1.22	2.01	-
1968	APRI	13	27.16	25.65	1.51	2.01	-
1968	APRI	20	26.87	25.56	1.31	2.01	-
1968	APRI	27	26.91	25.08	1.83	2.01	-
1968	MAY	4	27.55	25.95	1.60	2.01	-
1968	MAY	11	28.65	26.57	2.08	2.01	+
1968	MAY	18	28.66	27.40	1.26	2.01	-
1968	MAY	25	28.23	26.62	1.61	2.01	-
1968	JUNE	1	29.12	27.59	1.53	2.01	-
1968	JUNE	8	31.47	28.43	3.04	2.01	+
MEANS			33.02	31.14	1.87	1.90	
VARIANCES			18.1785	19.9298			

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SOURCES: 1. PRICES: CANADA DEPARTMENT OF AGRICULTURE,
LIVESTOCK AND MEAT TRADE REPORT, OTTAWA

2. FREIGHT RATES: CNR, MIN. 30,000 LBS